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(19)

(54) PRODUCT DISPENSER

(71) We, CIBA-GEIGY A.G. a body corporate, organised according to the laws of Switzerland, of CH-4002 Basle, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to product dispensers of the aerosol type for spraying a fluid, generally liquid, by aspiration with a liquefied gas propellant. More particularly, the present invention relates to such dispensers wherein the product is housed in a product container and coupled to an aerosol propellant cartridge separate from the product container through a coupler-aspirator, and wherein a single actuation causes the propellant to aspirate the product through the coupler-aspirator.

A great many dispensers of the aerosol type are known for dispensing a product upon aspiration by a liquefied gas propellant. Such containers comprise a single product and propellant container. The container houses the propellant cartridge and the product such that they are mutually isolated. Separate flow paths lead from the propellant cartridge and from the product through a common valve to a nozzle. When the valve is actuated, the product is aspirated by the propellant.

However, certain commercial disadvantages are inherent in such dispensers. In the use of such dispensers, it is necessary to create a seal between the common container and the valve or the valve collar. This becomes a complex practical problem in sophisticated dispensers. Also, the creation of a satisfactory seal becomes difficult with the use of certain materials.

Furthermore, the general manufacture of aerosol dispensers is a specialized industry. Therefore, manufacturers who wish to market products in aerosol form must acquire specialized knowledge and must invest large capital in specialized equipment. An alternative is to 'farm out' such aerosol production to specialized aerosol manufacturers. This, of course, reduces the amount of control which the product manufacturers can exercise over the quality and manufacture of their product.

Also, the handling and shipping of aerosol units is much more complex and expensive than that of non-aerosol products. Special product containers are required, and special shipping regulations must be observed.

For economic reasons, the design of the aerosol unit must be such that the propellant is used up at approximately the same time as the product. This requires the propellant cartridge to be specifically designed for virtually each and every product which is manufactured. Manifestly, this individualization is expensive. Even though such design may be approximately achieved in the aerosol industry, normal manufacturing tolerances are such that invariably some of the product or propellant is wasted.

A dispensing system of the type such that the product is aspirated by a propellant, but wherein the product is housed in a product container separate from the propellant cartridge and is aspirated by the propellant separate from the product container through a coupler-aspirator, and wherein the product container need only be leak sealed and not pressure sealed, is known from U.S. Patent 2,749,178 granted to J. P. Larson on June 5, 1956. However, the coupler-aspirator in this dispensing system requires complicated rotary valve means housed in the coupler-aspirator. Actuation of this system in order to produce an aerosol spray cannot be effected easily by a user without employing both hands.

It is, therefore, an aim of the present invention to provide a product dispenser comprising a unit which need include only the product, the product container and a coupler, and may be readily combined with a standard and conventional aerosol propellant cartridge,

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and which may be easily actuated by a user employing only one hand.

It is another aim of the present invention to provide a dispenser sub-assembly that may be handled and shipped without the propellant, and therefore in the same manner as other non-aerosol products.

It is a further aim of the present invention to provide such a system which eliminates or at least reduces waste of the product or the propellant.

It is a further aim of the present invention to provide a one-piece coupler-aspirator and nozzle which may be inexpensively manufactured by routine moulding techniques.

It is a further aim of the present invention to provide an integral coupler-aspirator-valve assembly which may be easily detachably coupled to product containers and to propellant cartridges which do not have aerosol valves therein.

It is a still further aim of the present invention to provide an integral coupler-aspirator-valve assembly which may be inexpensively manufactured by routine moulding techniques.

It is yet another important aim of the present invention to provide a multi-component product dispenser of the type such that the product is aspirated by a propellant, wherein several components for making up the product are housed in a product container separate from the propellant cartridge and are aspirated by the propellant separate from the product container through a coupler-aspirator.

It is a further aim of the present invention to provide a multi-component product dispenser wherein an improved product container valve of simplified valve structure is adapted to be connected to a unified multiple sac adaptor.

It is a yet further aim of the present invention to provide such a system wherein the multiple sac adaptor may be sealed to a single flexible product sac in a manner to provide two or more isolated product chambers therein.

These aims are sought to be achieved in accordance with the present invention by the provison of an aerosol dispenser comprising (a) a product container having at least one compartment housing a product to be dispensed and bearing product outlet means, (b) a detachably mounted aerosol propellant cartridge containing an at least partially liquefied gas under pressure and having propellant outlet means directed toward and generally aligned with said product outlet means, and disposed above the latter in the normal orientation of the dispenser, (c) a coupler-aspirator unit disposed between and connecting said product outlet means and said propellant outlet means, said unit comprising a product aspirating and discharging nozzle including a propellant-accelerating convergent tubular chamber, for spraying product from said container, each of the product outlet means and propellant outlet means comprising a valve for controlling the flow of product and propellant, respectively, through the respective outlet means, the said unit being connected at spaced apart faces thereof to the two valves and having in its interior separate passage leading from each of the valves to the discharge nozzle, the said passage for the product communicating with the discharge nozzle at or downstream of the narrower end of said tubular chamber, and (d) guide means holding the product container and the propellant cartridge in a generally aligned relationship displaceably relative to each other and to said unit, against pressure of at least one return spring means, the arrangement being such that displacement of the propellant cartridge and the product container relative to each other and to said unit causes the valves to open for the flow of product and propellant therethrough and through the respective passages in the coupler-aspirator unit to the discharge nozzle, the propellant flowing through the nozzle producing a reduced pressure in the product container and thereby aspirating product to be dispensed into the nozzle. Preferably, said nozzle is a Venturi nozzle.

The construction set forth has a particular advantage if arranged so that the propellant cartridge is above the product container. Because aspiration of the product to the coupler aspirator unit then raises the product against the downward pull of gravity, if there is insufficient propellant, no product is aspirated and the aspirator nozzle does not become blocked if the propellant runs out. On substitution of a fresh propellant cartridge, correct dispensing can recommence without difficulty.

The preferred relative moving of product container and propellant cartridge is axial, the propellant cartridge acting as an actuating head for the dispenser.

In one form during use, the propellant cartridge is depressed, and force is applied downwardly to the coupler-aspirator unit. As this occurs, the propellant valve stem is moved downwardly with respect to the coupler-aspirator unit and the coupler-aspirator unit is moved downwardly with respect to the product container valve stem. This action causes both a high and a low pressure obturating means to be moved away from their respective radial openings. This allows communication of the product through the product container valve stem and into the second flow passage within the coupler-aspirator unit. Likewise, communication is open for the propellant through the propellant valve stem and the first flow passage

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of the coupler-aspirator unit. Thus, the propellant is caused to aspirate the product through the coupler-aspirator unit.

An embodiment of a coupler-aspirator unit for a product dispenser according to the invention, which is particularly simple to manufacture, is characterized in that the passage for propellant in the unit is connected to a narrower duct which opens into a mixing chamber of enlarged diameter, into which the passage means for product open, and that the mixing chamber opens into a nozzle mouth of outwardly divergent cross-section disposed in the wall of the coupler-aspirator unit.

This simplified integral coupler-aspirator unit and nozzle element in which no separate nozzle insert is required, has a first chamber adapted to be coupled to the valve stem of a standard aerosol propellant cartridge and a second chamber adapted to be coupled to the stem of a product container valve. The first chamber communicates with a first flow passage which in turn communicates with an orifice of an integrated nozzle. The second chamber communicates with a second flow passage which in turn communicates through the above mentioned mixing chamber with the integrated nozzle. When the dispensing system is actuated, the propellant from the standard propellant cartridge then flows through the first chamber, the first flow passage, the orifice and into the mixing chamber. This flow of the propellant aspirates the product or products from the product container into the second chamber, the second flow passage and the mixing chamber. The product and propellant are thus mixed in the mixing chamber and are sprayed through the nozzle opening.

In a simple embodiment of a product dispenser according to the invention, the valve housings are separated from the said coupling means, and the coupler-aspirator unit in such dispenser must be joined with a nozzle insert for the purpose of spraying the product. The provison of a separate nozzle and separate coupler-aspirator unit manifestly requires the manufacture of two separate items and the subsequent assembly thereof.

Therefore, in an advantageous embodiment of the dispenser according to the invention the valve housings are integral with the coupling means of the coupler-aspirator unit. This requires a coupler-aspirator valve assembly which comprises the coupler-aspirator unit proper and both the product container valve and the propellant valve.

Even more particularly, this embodiment of the invention relates to such an assembly wherein the aerosol valve and the product container valve include piercing means adapted to pierce a respective aerosol propellant cartridge and a product container assembly when assembled to the coupler-aspirator valve assembly.

Furthermore, it is generally of advantage, in dispensers according to the invention, that the guide means mentioned hereinbefore are rigidly mounted on the product container and that propellant cartridge is axially displaceable therein.

According to yet another embodiment of a product dispenser according to the invention, in which the guide means are also rigidly connected to the product container, the propellant cartridge and coupler-aspirator unit are tiltable in the guide means, whereby the valve stems are displaced relatively to the gasket means so as to free the valve stem ducts and permit flow of propellant and product, respectively, therethrough toward the discharge nozzle.

It is another important and advantageous feature of the dispensers of the invention that the discharge nozzle is mounted at a lateral extension of the coupler-aspirator unit, and that the guide means are provided with an opening at the level of the coupler-aspirator unit, through which opening the discharge nozzle can discharge product when the valve stems and gasket means are in dispensing positions relative to each other.

The valve stems in the dispensers according to the invention can be male stems and the coupling means then have recesses in which the stems are received; alternatively, the coupling stems can be male members and the valve stems have recesses for receiving said male coupling members therein.

In these product dispensers according to the invention, at least one of the passage means in the coupler-aspirator unit can be provided with screen means for filtering out solid particles from the flow of propellant or product or from both the propellant and product.

In product dispensers according to the invention, the discharge nozzle is preferably a Venturi-type nozzle comprising, in the direction of propellant flow therethrough, a convergent chamber, a narrow neck duct and a divergent discharge chamber, to the wider end of which latter passage means for propellant are connected and, most preferably, an annular product feeding chamber about the neck duct and radial inlet conduits connecting this annular product feeding chamber and the neck duct with each other, the passage means for product being connected to the annular product feeding chamber.

According to another aspect thereof, the present invention relates to a dispensing system of the pressurized type for spraying a multi-component fluid, generally liquid by aspiration with a liquefied gas propellant.

More particularly, the present invention relates to such a system wherein the multiple components of the product are housed in a

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non-pressurized product container and coupled to a propellant cartridge separate from the product container through a coupler-aspirator, and preferably to such a system wherein a single actuation causes the propellant to aspirate and combine the product components through the coupler-aspirator.

Dispensers are known for dispensing multi-component products upon aspiration by a liquefied gas propellant. Such dispensers comprise a single product-propellant container. The container houses the propellant cartridge and the several product components. The propellant and the several products are all isolated from each other. Various flow paths lead from the products and the propellant through a common valve to a nozzle. When the valve is actuated, the products are combined and aspirated by the propellant.

However, certain commercial disadvantages are inherent in such dispensers. In the use of such dispensers it is necessary to create a seal between the common container and the valve collar. This becomes a complex practical problem with sophisticated dispensers. Also, the creation of a satisfactory pressure or liquid-tight seal becomes difficult with the use of certain materials.

The aims of this invention mentioned hereinbefore in relation to such multi-component dispensers are sought to be achieved by the provision of a product container containing at least one flexible, collapsible and/or contractible product sac in communication with a product container valve, and either an additional flexible product sac in communication with the product container valve, or a dip tube opening into the product container and in communication with the product container valve. The product container valve and valve collar is leak-sealed to the product container. The outlet of the product container valve communicates with at least one flow path in a coupler-aspirator. A second flow path in the coupler-aspirator is adapted to communicate with the outlet valve of a conventional propellant cartridge mounted in alignment with the product container. The two flow paths in the coupler-aspirator join at a Venturi nozzle therein for spraying the multi-component product. When the propellant cartridge is pressed downwardly, both the propellant cartridge valve and the product container valve are opened. This allows the multi-component product to be aspirated by a propellant through the coupler-aspirator, in the same manner as in the embodiments of dispensers according to the invention described hereinbefore.

These multiple-component product dispensers, in which the product container encloses at least one flexible, collapsible or contractible sac as a compartment holding a product component therein, also comprise, for each sac, a sac adaptor which is provided for joining each sac to the valve housing of said product outlet means.

Such a product dispenser can have a single product sac lodged inside the product container, but, in any case, the multi-component product container comprises at least two separate product compartments for different product components, and separate duct means are provided in the valve housing of the product outlet means for the flow of each of several product components separately from each product compartment of said product container, respectively, via the said valve stem of the product outlet means into the coupler-aspirator unit.

In a first embodiment of a multi-component product container according to this aspect of the invention, the product container constitutes an outer mantle for the product sac or sacs and is provided with openings for admitting outside air into the interior of the mantle surrounding the sac or sacs, the latter being in sealing engagement with the valve housing to prevent the entry of outside air into its or their interior.

In preferred multi-component product dispensers, there are provided two or more product sacs inside the product container, each of these sacs being equipped with a sac adaptor joined to the valve housing of the product outlet means.

However, the product container may also sealingly engage the valve housing of the product outlet means, and a dip tube extends from the valve housing into the space in the product container outside the product sac or sacs, so that the interior of the container surrounding the former may also contain one of the product components.

When there are provided two product sacs inside the product container, of which a first sac is disposed inside a second of the sacs, there can be provided a common adaptor having separate channels for the product component for each of the sacs and leading to separate compartments in the valve housing to which said adaptor is joined.

In a preferred embodiment of the product dispensers according to this invention, two gaskets are provided in the product valve housing, and the latter includes a member having an inwardly extending flange part being engaged by one of the two gaskets, the other gasket being disposed between the valve housing and the collar means provided on the product container, both of the said gaskets engaging the valve stem of the product valve assembly and controlling separate flow-paths through the valve housing for the two product components from the two product sacs.

The passage means for product in coupler-aspirator units for use in multi-component product dispensers may comprise a single flow

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passage to the discharge nozzle, in which flow passage the product components are mixed with each other, or, preferably, it may comprise mutually isolated flow passages leading to the discharge nozzle, one such flow passage being provided for each product component, and the said components are mixed only in the discharge nozzle.

A further preferred and simplified structure of multicomponent product dispensers is characterized by the valve housing of the product outlet means comprising in annular portion, a base portion enclosing a housing chamber; and a stationary stem having a central duct therein communicating with the interior of one of said sacs, which stationary stem extends from the base portion into the housing chamber, while the valve stem of the product outlet means comprises a movable stem member which is slidably mounted within the housing chamber around the said stationary stem, and an internal annular flexible gasket is mounted in the said movable stem member and engages the stationary stem to obturate the duct in the latter when the dispenser is in non-dispensing position.

According to another feature embodied in this invention the coupling means of the coupler-aspirator unit for connection to the product outlet means have a central recess as well as product component duct means separate from the said recess communicating with the aforementioned housing chamber, both the central recess and the duct means communicating with the discharge nozzle via a first passage means or via separate passage means, and a unitary sac adaptor having several tubes, one of which tubes communicates with the said central recess, and the remaining tube or tubes of the several tubes being connected to a different product compartment in the product container.

According to yet another feature embodied in this invention the above mentioned movable stem member comprises a flange portion, integral with or separable from a portion of the stem member housing an internal gasket, which flange portion supports an annular flexible gasket mounted on the outer rim of the annular valve housing portion and obtaining the duct means of the coupler-aspirator unit, when the dispenser is in non-dispensing position.

In a preferred embodiment of multiple-component product dispensers the product container holds a unitary product sac of flexible, collapsible or contractible material, which sac has separate chambers, each of which holds a different product component, each of the said sac chambers serving as a product compartment, one of which communicates via different flow paths through the adjoining valve housing with the aforesaid central recess and each of the remaining sac chambers with a different duct means in the coupler-aspirator unit.

More in detail, dispersers having such simplified structure comprise a product container advantageously having a product container valve collar attached thereto, and extending through the collar is a product container valve including a unified annular body member including a stationary stem. Between the annular body member and the collar is positioned a first flexible annular gasket. A movable stem member includes a second annular body member and an annular tube. Between the annular tube and the second annular body member is positioned a second flexible annular gasket. The annular tube thus acts as a retaining ring to hold the second flexible annular gasket in place. The movable stem member is movably mounted around the stationary stem of the first annular body member. An integral dual sac adaptor is adapted to fit into the first annular body member. A first adaptor tube of the dual sac adaptor fits through the first annular body member and communicates with a hollow passage within the stationary stem. A second adaptor tube of the dual sac adaptor extends through the first annular body member into a passage therein. When the movable stem member is depressed, communication is opened through annular openings in the stationary stem to the hollow passage therein. When the movable stem member is depressed, Communication is open between the annular chamber in the first annular body member and longitudinal passages within the second annular body member. The duel sac adaptor is adapted to be sealed to a single flexible product sac in such a manner that two isolated chambers are created therein. Alternatively, single sac adaptors and single flexible product sacs may be connected to the first annular body member.

The preferred embodiments of this invention will be described with reference to the accompanying drawings.

Fig. 1 is a partial cross-sectional view of the first embodiment of the present invention where the product is contained in a flexible product sac;

Figs. 1A and 1B show the valve of a propellant cartridge used in the embodiment of Fig. 1, which valve is in closed and open positions, respectively.

Fig. 2 is a partial cross-sectional view of a second embodiment of the present invention where the product is housed in the product container;

Fig. 3 is a partial cross-sectional view of a third embodiment of the present invention;

Fig. 4 is a cross-sectional view of a first modified coupler-aspirator embodied in the present invention; and

Fig. 5 is a cross-sectional view of a por-

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tion of a second modified coupler-aspirator embodied in the present invention.

Fig. 6 is an elevatonal view of a dispenser according to the invention containing another embodiment of a coupler-aspirator-nozzle.

Fig. 7 is an enlarged cross-sectional view of the coupler-aspirator-nozzle shown in Fig. 2; and

Fig. 8 is a cross-sectional view taken along lines VIII—VIII of Fig. 7.

Fig. 9 is a cross-sectional view of an embodiment of a coupler-aspirator-valve assembly according to another aspect of the present invention;

Fig. 10 is a cross-sectional view of the product container assembly adapted to be used with the coupler-aspirator-valve assembly of Fig. 9;

Fig. 11 is a cross-sectional view of a modified illustration of a product container assembly embodied in the present invention;

Fig. 12 is a cross-sectional view of an aerosol propellant cartridge adapted to be used with the coupler-aspirator-valve assembly of Fig. 9;

Fig. 13 is a cross-sectional view of the coupler-aspirator-valve assembly of Fig. 9 assembled with a product container assembly of Fig. 10 and the propellant cartridge of Fig. 12; and

Fig. 14 is a cross-sectional view of the assembly of Fig. 13 shown in the actuated or dispensing position.

Fig. 15 is an elevational illustration of the basic features of a first embodiment of a multi-component product dispenser according to the present invention, shown in conjunction with a conventional aerosol propellant cartridge;

Fig. 16 is a cross-sectional view in detail of the lower or product portion of the dispenser shown in Fig. 15;

Fig. 17 is a cross-sectional view taken along line XVII—XVII of Fig. 16 illustrating the stem;

Fig. 18 is a cross-sectional view of a second embodimbent of the valve assembly of the multi-component product dispenser shown in Figs. 15 to 17;

Fig. 19 is a cross-sectional view of a third embodiment of the aforesaid valve assembly of a dispenser as shown in Figs. 15 to 18;

Fig. 20 is a cross-sectional view of a fourth embodiment of the aforesaid valve assembly of a dispenser as shown in Figs. 15 to 19;

Fig. 21 is a cross-sectional view of a fifth embodiment of a valve assembly of a dispenser as shown in Figs. 15 to 20;

Fig. 22 is a cross-sectional view of a modification of the embodiment of part of multi-component product dispenser shown in Figs. 15 and 21;

Fig. 23 is a cross-sectional view of a modified coupler-aspirator unit usable in multi-component dispensers according to the present invention;

Fig. 24 is a cross-sectional view taken along line XXIV—XXIV in Fig. 23;

Fig. 25 is a cross-sectional view taken along line XXV—XXV in Fig. 23;

Fig. 26 is a cross-sectional view of a further modification of a coupler-aspirator unit for use in multi-component product dispenser in accordance with the present invention.

Fig. 27 is an elevational illustration of the basic features of a modified multi-component product dispenser of the present invention similar to that shown in Fig. 15;

Fig. 28 is a cross-sectional view in detail of an improved product container valve for use in a dispenser as shown in Fig. 27;

Fig. 29 is a cross-sectional view of the improved product container valve of Fig. 28 shown in the actuated position;

Fig. 30 is a cross-sectional view taken along line XXX—XXX in Fig. 28; and

Fig. 31 is a cross-sectional view taken along line XXXI—XXXI in Fig. 28.

With reference now to Fig. 1 of the drawings, a first embodiment of the dispenser in accordance with the present invention will be described.

A product container 1 is adapted to contain a flexible product sac 2 enclosing a suitable product 2a to be dispensed therefrom. Sac 2 may be made of any suitable material which is compatible with the product to be dispensed. Product container 1 may also be made of any suitable or desirable material such as a plastics metal, fibreboard, etc. A product container valve 4 is seated in valve collar 5. Valve collar 5 is sealed to container 1 in any conventional manner. The seal between collar 5 and container 1 need not be a pressure seal or leak-proof seal since container 1 does not house a propellant and the product is contained in a sac. The interior of sac 2 is in a communication with a product flow path within valve 4 in a conventional manner, one example of which will be described in detail below.

The outlet of product container valve 4 is in communication with a first flow passage 7 in a coupler-aspirator 6. First flow passage 7 and a second flow passage 8 join in a Venturi nozzle 9 from which the product is sprayed. Second flow passage 8 is adapted to communicate with the stem 10 of the conventional aerosol valve 11 of a conventional aerosol propellant cartridge 12.

Aerosol valve 11 comprises a valve housing 11a, and the latter houses in its interior a spring 19 which biases stem 10 so that, in the non-actuated position as shown in Fig. 1A, axial stem duct 10a, which opens at its inner end through radial passage 10b in the side wall of stem 10, has these passages

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obturated by an annular flexible gasket 18, while, in dispensing position as shown in Fig. 1B, these passages are open.

Flexible gasket 18 and valve housing 11a are held in position at the mouth of propellant cartridge 12 by means of a crimped-on cap member 20.

Propellant cartridge 12 contains a suitable liquefied gas propellant 13. A dip tube 14 is attached to or integral with propellant valve housing 11a, since the propellant cartridge 12 will normally be positioned above the product container and, therefore, used in the inverted position. This enables only vaporized propellant to be withdrawn. Product container 1 is provided with a guide 15 which is adapted to fit in any conventional manner, such as a snap fit, over the top of the product container. Guide 15 acts to guide and laterally support propellant cartridge 12, as shown in Fig. 1. Coupler-aspirator 6 extends to and sprays through a hole 16 in the wall of guide 15. Container 1 is provided with holes 17 in any suitable location for the purpose of providing air vents in the container. Holes 17 allow equalization of atmospheric pressure within container 1 and around product sac 2. Thus, as product is dispersed from sac 2, the pressure is equalized therearound to ensure complete or continued dispensing.

As previously mentioned, product container valve 4 may be any such conventional device. One example of such a valve is shown in Fig. 1 and will now be described. Valve collar 5 has a central opening 5a therein. Just below opening 5a annular gasket 21 is supported on a product valve housing 22. A crimp 23 in collar 5 acts to retain valve housing 22 in place and to hold gasket 21 in place. Flexible product sac 2 is connected to a sac adaptor 24. Sac adaptor 24 extends through and is held in place by the inner periphery of valve housing 22. Slidably mounted within annular chamber 25 in the interior of valve housing 22 is a valve stem 26. Stem 26 has therein a longitudinal passage or duct 27 which communicates at its lower end with a radial passage 27a. Radial passage 27a extends to the outer surface of valve stem 27. A spring 29 urges valve stem 26 in an upwardly closed position. In this closed position the inner periphery of gasket 21 closes radial passage 27a.

The general operation of the dispenser shown in Fig. 1 will now be described. The operator grasps the unit generally around guide 15. Pressure is then applied by finger or thumb in the general direction of arrow P. Since container 1, coupler-aspirator 6 and cartridge 12 are aligned, the pressure from the propellant cartridge 12 causes aerosol valve 11 to be opened and also pushes down the coupler-aspirator 6. This pressure is transferred to stem 26. As stem 26 is pushed down against the force of spring 29, radial passage 27a becomes clear of gasket 21. Communication is then opened between the interior of product sac 2, sac adaptor 24, chamber 25, radial passage 27a, stem duct 27, flow passage 7, and nozzle 9. Thus, it will be apparent that as propellant cartridge 12 is depressed, both the propellant container aerosol valve 11 and the product container low pressure valve 4 are opened. Only pressure sufficient to open the stiffer of these two valves is required. When both valves are opened the propellant will aspirate the product through the above-mentioned path and cause it to be sprayed from nozzle 9.

In the dispenser shown in Fig. 1, the product is enclosed in a flexible product sac. Thus the product container may be provided with various holes 17 therein to ensure equalization of pressure within the product container further to provide for continued dispensing of the product from the sac. However, as also previously mentioned, it is possible to enclose the product within the prodct container itself, rather than in a flexible product sac. However, it is manifest that if such arrangement is made, the pressure equalization holes may not be provided in the product container and the seal of the collar to the product container must be leakproof.

Therefore, with reference now to Fig. 2, a second embodiment of the present invention will now be described wherein the product is located within the product container and means are provided within the valve for pressure equalization within the product container. The product 2a is enclosed within product container 1a. Dip tube 24a extends into the product and is fitted into sleeve 24b in product valve housing 22a.

Valve housing 22a is supported on the inner periphery of a downwardly extending projection 5d of collar 5. Gasket 21 is held in place between collar 5 and valve housing 22a. Collar 5 is sealed to container 1a in a conventional manner to provide a leakproof seal. Slidably mounted within the interior chamber 25 of valve housing 22a is valve stem 26. Radial openings 27a extend from the longitudinal center duct 27 of stem 26 into chamber 25. Gasket 21 has the inner periphery thereof obturating the radial openings 27a and thus serves as a low pressure obturator. Annular depending projection 5d of collar 5 has a slot 5b therein.

It will be apparent that as the unit is actuated and stem 26 is depressed, gasket 21 is moved downwardly. This of course, opens communication between product in product container 1a through dip tube 24a into chamber 25 through openings 27a and into duct 27. Simultaneously, gasket 21 is moved away from annular ridge 5c of collar 5, and there is then communication between the atmos-

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phere above collar 5 and the interior of container 1a through slot 5b. Thus, as product is aspirated from the interior of container 1a, atmospheric pressure is introduced into container 1a to equalize the pressure therein, and to thus ensure continued dispensing of the product therefrom.

The construction of the coupler-aspirator is the same as that disclosed with regard to the embodiment of Fig. 1. Therefore, as the operator depresses propellant cartridge 12, both the product container valve 4 and the aerosol valve 11 are opened. Thus, the propellant flows through flow passage 8 of coupler-aspirator 6 to aspirate the product through flow passage 7 whereby the product is sprayed from nozzle 9.

In the embodiments of the invention discussed with regard to Figs. 1 and 2, the aerosol and product valves were actuated upon depression. However, it is to be understood that it is within the scope of the present invention to include aerosol and product valves which are actuated up to being tilted in a generally horizontal direction. With reference then to Fig. 3 of the drawings, a further embodiment of the present invention incorporating the use of tiltable valves 4a will be described. A product container 1b houses a product to be dispensed. The product may be contained either within a flexible product sac in the manner described with reference to Fig. 1 or the product may be housed in the container itself in the manner described with reference to Fig. 2. A suitable tiltable product container valve 4a is seated within the collar of product container 1b. A coupler-aspirator 6 is coupled to the stem of the tiltable product valve in a manner similar to the embodiments shown in Figs. 1 and 2 such that the interior of the stem is in communication with first flow passage 7. A standard aerosol propellant cartridge 12a having a conventional tiltable aerosol valve 11a is coupled via stem 10 with coupler-aspirator 6 to communicate with second flow passage 8 therein in a manner similar to that described with reference to Figs. 1 and 2. A guide 15a fits over the top of product container 1b in a manner similar to that described with the previous embodiments. However, guide 15a has a closed top portion 15b and provides lateral support for cartridge 12a only at an upper reduced diameter recess 15c in top guide portion 15b. Coupler-aspirator 6 extends to and sprays through a hole 16 in guide 15a. Guide 15a may also include a hole 17a on the side thereon opposite hole 16.

The operation of tiltable aerosol valves is well-known in the art. Therefore, a complete description of valves 4a and 11a will herein be dispensed with.

The operation of the embodiment of the invention shown in Fig. 3 will now be described. The operator again generally grasps the unit around guide 15a. However, force is applied against cartridge 12a in a generally horizontal direction as indicated by arrow p1 p' by a thumb or finger extending through hole 17a in guide 15a. As this occurs, the valve end of cartridge 12a is caused to tilt in a right-hand direction as viewed in Fig. 3. This of course tends to move the upper part of coupler-aspirator 6 also in a right-hand direction as viewed in Fig. 3. However, coupler-aspirator 6 resists this movement due to its close fit with stem 10. This resistance causes stem 10 to be tilted with regard to the axis of cartridge 12a. This tilting action causes valve 11b to be opened in a conventional manner. As the top of coupler-aspirator 6 is caused to be moved in a right-hand direction as viewed in Fig. 3, the remainder of coupler-aspirator 6 is also caused to move generally in this direction. As this occurs the top of the product container valve stem 26 is caused to be moved in a right-hand direction as viewed in Fig. 3. This causes the stem to be tilted, thereby opening valve 4a in a conventional manner. At this point, the product within container 1b is in communication with flow passage 7 through the valve 4a and the aerosol propellant is in communication with flow path 8 through valve 11a. Thus, the product is aspirated by the propellant in a manner similar to that described in the case of the embodiments shown in Figs. 1 and 2. When force on the cartridge 12a is released, the components return to their original positions due to the normal urging of the valves 11a and 4a.

Alternatively, guide 15a may be provided with a hole 17b on the same side thereof as hole 16. In this embodiment the tilting of the valves would be in the left-hand direction as viewed in Fig. 3.

With reference now to Fig. 4 of the drawings, a modified form of the coupler-aspirator will be described. Coupler-aspirator 6 is similar to that shown in Figs. 1, 2 and 3 and has a first flow passage 7 adapted to communicate with a product container valve through chamber 35. A second flow passage 8 is adapted to communicate with an aerosol propellant cartridge through chamber 34. However, passage 8 opens into an enlarged chamber 34a. Chamber 34a communicates with chamber 34. However, a filtering screen 8a having a generally conical shape fits within chamber 34a and is retained therein by annular bead 34b. Screen 8a operates to filter out debris or dust that might otherwise accumulate in chamber 35 during shipment or storage when the propellant cartridge is not yet in place. The accumulation of such debris or dust could easily clog nozzle 9, and thereby prevent the operation of the unit. Thus, the provision of screen 8a prevents such blockage of the unit before a propellant cartridge is assembled thereto.

In all of the embodiments of the present invention so far described, the coupler-aspira-

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tor has been detachably coupled to male product and aerosol valve stems. However, it is to be understood that it is within the scope of the present invention as defined by the appended claims to include a coupler-aspirator having male stems adapted detachably to couple with female product and aerosol valves. Thus, with reference now to Fig. 5 of the drawings, one such arrangement of the coupler-aspirator having male stems at point A or B will be described. In Fig. 5 is shown one form of a stem, in this instance adapted to be coupled to a female aerosol propellant and/or product valve. Coupler-aspirator 6 includes a stem portion 8d through which flow passage 8 communicates. Thus, the stem portion 8d would be inserted within a female valve of a standard aerosol cartridge and/or product container. The unit so modified would operate in the same manner as previously discussed embodiments of the invention. It is to be understood that many variations of such a male stem are possible and that these variations are intended to be included within the scope of the present invention as defined by the appended claims.

It is also to be understood that any standard propellant cartridge may be used. The cartridge need not be specially designed with regard to the quantity of the product contained in the unit. When the propellant is exhausted, it need merely be replaced by another standard propellant cartridge. Additionally, when the products are exhausted, and when some of the propellant remains, the propellant cartridge may be transferred to a new product dispenser. Thus, it is apparent that the system in accordance with the present invention eliminates or reduces waste to both the product and the propellant.

As previously mentioned, all of the various parts of the various embodiments of the present invention above described may be made of any desirable conventional material. For instance, all of these parts may be molded of plastics material by conventional moulding techniques, thus making possible the provision of such dispensers at a low cost.

The flexible sacs described are preferably of the thin-walled type and have a great flexibility. These sacs may be made of any suitable material which is compatible with the products used therein.

Thus, it will be seen that there has been provided a product dispenser which may be manufactured inexpensively, The dispenser of this invention may manifestly provide greatly improved commercial exploitation of products which heretofore have not been distributed in aerosol form. The unit as described above may be manufactured and adapted to be later combined with a conventional aerosol cartridge. The provision of the dispenser of this invention reduces or eliminates a great many manufacturing problems. The product container need not be pressure-sealed. The product unit need not be shipped or handled under aerosol regulations, since the unit contains no aerosol cartridge. The waste of either the propellant or the product, heretofore unavoidable, is eliminated.

With reference now to Fig. 6 of the drawings, the product dispenser of the present invention in which another embodiment of the coupler-aspirator unit is used will be described. The product container 1 is adapted to contain a product or products to be dispensed therefrom. Product container 1 may be made of any suitable or desirable material such as plastic or metal. The product container valve 4 of any suitable design extends through the top of product container 1. Product container valve 4 contains suitable product flow passages (not shown) to provide communication of the product or products within product container 1 with the stem 26 of the product container valve.

The coupler-aspirator unit 6 consists of a body 33 and has first and second chambers 34 and 35, respectively, therein. Second chamber 35 is adapted to be coupled to the stem 26 of the product container valve 4. The first chamber 34 is adapted to be coupled to the stem 10 of a conventional aerosol valve 11 of a conventional aerosol propellant cartridge 12. Propellant cartridge 12 contains a suitable liquefied gas propellant 13. A dip tube 14 is provided in propellant cartridge 12. Product container 1 is provided with a guide 15. Guide 15 acts to guide and laterally support propellant cartridge 12, as shown in Fig. 6. Coupler-aspirator 6 sprays through a hole 16 in guide 15.

With reference now to Figs. 7 and 8 of the drawings, the coupler-aspirator unit 6 will be described in more detail. The first chamber 34 and second chamber 35 of the coupler-aspirator unit 6 communicate with first and second flow passages 7 and 8, respectively. First flow passage 7 has widened portion 36, and second flow passage 8 has a widened portion 37 to aid in the passage of the propellant and product, respectively, from the first and second chambers. First flow passage 7 communicates with a duct 38. Duct 38 communicates with one end of a mixing chamber 39. Second flow passage 8 communicates with the mixing chamber 39. The other end of the mixing chamber 39 communicates with the nozzle mouth 9a.

As shown in Fig. 8 of the drawings, the body 33 of the coupler-aspirator unit 6 is generally in the form of a cylinder with portions thereof cut away to form opposite longitudinal flat surfaces 6c and 6d. Indexing guides 41 and 42 are provided for preventing the coupler-aspirator unit from being inadvertently moved from orientation with hole 16. Indexing guides 41 and 42 each have flap portions 41a and 42a, respectively, and diverg-

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ing portions 41b and 42b, respectively. Flap portions 41a and 42a are adapted to fit against surfaces 6c and 6d, respectively, of body 33. The ends of diverging portions 41b and 42b may conveniently be attached to the inner surface of guide 15. Thus, it will be apparent that coupler-aspirator unit 6 may not be rotated or disoriented with relation to hole 16 once the unit has been assembled. This arrangement manifestly ensures that product sprayed from nozzle mouth 9a will always be directed through hole 16 in the guide 15. It will be apparent to those skilled in the art that many variations of the arrangement of indexing guides 41 and 42 are possible. For instance, flap portions 41a and 42a could be attached to surfaces 6c and 6d, respectively, and the ends of diverging portions 41b and 42b could be dimensioned snugly to contact the inner surface of guide 15. This arrangement would, of course, likewise provide the desired result, i.e. preventing disorientation of the coupler-aspirator unit with respect to hole 16. It is to be further understood that the general configuration of body 33 is not limited as above described. For instance, body 33 could be in the form of any polyhedron, such as a cube or oblong. It is to be even further understood that the specific configuration of indexing guides 41 and 42 may be modified without departing from the scope of the present invention as defined by the appended claims.

It is to be further understood that the coupler-aspirator unit 6 can be made of any convenient or desirable material, such as plastics. The coupler-aspirator 6 can easily be made by conventional moulding techniques, thus, making possible the provision of such device at a low cost. For instance, the coupler-aspirator unit shown in Figs. 7 and 8 may be made in a single moulding step, by merely employing the use of three simple moulding pins.

It is also to be understood, that the detachable coupling means of the coupler-aspirator unit of this invention may be male rather than female as illustrated in the drawings. This of course, would be the case when the valves of the product container or the propellant cartridge were female, rather than male.

The operation of a dispenser will now be described in more detail. As propellant cartridge 12 is depressed, both the propellant cartridge valve and the product container valve are opened. When this occurs, the propellant from the cartridge 12 is free to flow through the stem 10 into first chamber 34, first flow passage 8, duct 38 and mixing chamber 39. The flow of the propellant through mixing chamber 39 will aspirate the product through the product container valve and into second chamber 35, second flow passage 8 and mixing chamber 39. It will be apparent that the product and propellant are mixed in mixing chamber 39 and are then sprayed therefrom through nozzle mouth 9a.

It is to be understood that any standard propellant cartridge may be used. The cartridge need not be specially designed with regard to the quantity of the product contained in the unit. When the propellant is exhausted, it need merely be replaced by another standard propellant cartridge. Additionally, when the products are exhausted, and when some of the propellant remains, the propellant cartridge may be transferred to a new product dispenser. Thus, it is apparent that the system in accordance with the present invention eliminates or reduces waste of both the product and the propellant.

With reference now to Fig. 9 of the drawings, a coupler-aspirator-valve according to another aspect of the present invention will be described in detail. The assembly includes a coupler-aspirator valve unit 6 having first and second flow passages 7 and 8, respectively, therein. Flow passages 7 and 8 join at Venturi nozzle 9 inserted within the unit 6. Flow passage 8 also communicates with a first chamber 46 within the unit. A first annular gasket 47 has its outer edge in place by recessed portion 6a of unit 6 to be positioned within chamber 46. A propellant valve stem 48 is positioned for movement within a guide chamber 54. Longitudinal channel 49 extends through stem 48 and terminates at one end thereof in radial openings 50. The inner periphery of gasket 47 obturates radial openings 50 and thus serves as a high pressure obturator. Positioned within the other end of stem 48 and communicating with channel 49 is a tubular piercing member 51.

Unit 6 is positioned within a guide 52. An inwardly extending transverse wall 53 of guide 52 has a central opening 53a therein through which extends a reduced diameter portion 48b of a flange 48a at the outer end of stem 48.

Flange 48a has its upper surface abutting the bottom surface of transverse wall 53 to limit movement of and act as a stop for stem 48 in the upward direction as viewed in Fig. 9. Chamber 46 has fins 55 therein for limiting the downward movement of stem 10 in relation to the unit 6. The upper length 56 of guide 52 is adapted to laterally support a propellant cartridge which may be inserted therein. When such a propellant cartridge is inserted within the upper length 56 of guide 52, the piercing member 51 is adapted suitably to pierce the cartridge. An opening 57 is provided in the guide 52 through which the unit 6 extends and sprays.

Flow passage 8 in coupler-aspirator 7 communicates with a product chamber 58. A flexible annular gasket 59 has its outer edge held in place by recessed portion 43b of unit 6 to be positioned within chamber 58. A product container valve stem 60 is positioned for

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movement within chamber 58. Longitudinal channel 61 extends through product container valve stem 60 and terminates at one end thereof in radial openings 62. The inner periphery of annular gasket 59 closes radial openings 62 and thus serves as a low pressure obturator. Integral with the other end of product container valve stem 60 is product container valve plate 63. The plate or disc 63 is attached in any suitable manner to the bottom rim 52a of guide 52. Plate 63 has a depending annular flange 61 thereon which is adapted to be coupled to the top or collar of a product container in any desirable manner such as by means of lock flanges 65. Chamber 58 has fins 66 therein which limit the extent of movement of unit 6 with respect to product container valve stem 60. A tubular piercing member 67 is positioned within the other end of stem 60 and container valve plate 63 and is in communication with stem channel 61. Hollow piercing member 67 is thus adapted to pierce a product container when the assembly is coupled thereto.

With reference now to Fig. 10 of the drawings, a product container assembly adapted to be used with the coupler-aspirator-valve assembly of Fig. 9 will be described in detail. A container 70 has a collar 73 attached thereto in any conventional manner. A flexible product sac 71 containing the product to be dispensed is positioned within product container 70. Sac 71 may be blow-moulded to have a suitable thickened neck portion 72. The seal between collar 73 and container 70 need not be a pressure seal since the container 70 does not house a propellant. Also, since the product is not enclosed in container 70, the seal between container 70 and collar 73 need not be leakproof. Enlarged rim 75 of neck portion 72 is adapted to be supported by downwardly extending annular flange 74 of collar 73. Integral with neck portion 72 is outer flange 72a which may be contacted by a tool to facilitate assembly of sac 71 to collar 73. Positioned between collar 73 and enlarged rim 75 is a gasket 76 which closes passage 77 through neck portion 72 of product sac 71. Gasket 76 is adapted to be pierced when the product container assembly is assembled to the coupler-aspirator-valve assembly shown in Fig. 9. Container 70 is provided with holes 78 in any suitable location for the purpose of providing air vents in the container. Holes 78 allow equalization of atmospheric pressure within the container 70 and around product sac 71. Thus, as product is dispensed from sac 71, the pressure is equalized therearound to ensure complete and continued dispensing.

With reference now to Fig. 11 of the drawings, a modified embodiment of a product container assembly adapted for use with the coupler-aspirator-valve assembly of Fig. 9 will be described in detail. A flexible product sac 81 containing a suitable product to be dispensed is housed in container 80. Product sac 81 is suitably manufactured to have a thickened neck portion 82. However, product sac 81 has additionally been suitably manufactured to provide an integral membrane 86 which closes passage 87 through neck portion 82. In addition, product sac 81 has been manufactured such that collar portion 83 is integral therewith. As was the case in the product container assembly of Fig. 10, the seal between collar 85 and product container 80 need not be a pressure seal since the product container 80 does not house a propellant. Likewise, the seal need not be leakproof since the product is housed within the sac 81. Container 80 is provided with holes 88 in a manner similar to the embodiment shown in Fig. 10. It will be apparent that membrane 86 is adapted to be pierced when the product container assembly is assembled to the coupler-aspirator-valve assembly shown in Fig. 9. The bottom of product sac 81 is sealed in any suitable manner such as heat sealing as shown at 89 after the sac has been filled with a suitable product.

With reference now to Fig. 12 of the drawings, a propellant cartridge adapted to be used with the coupler-aspirator-valve assembly shown in Fig. 9 will be described in detail. The cartridge 90 houses a suitable propellant 91. Cartridge 90 has a circular opening 92 therein. A suitable stopper 93 is tightly held in place in opening 92 by crimp 94. Since the cartridge is under high pressure, it is necessary that crimp 94 provide a pressure seal with stopper 93. It will be apparent that when the propellant cartridge 90 is assembled with the coupler-aspirator-valve assembly 1, the stopper 93 will be pierced by piercing member 51.

With reference now to Fig. 13 of the drawings, the coupler-aspirator-valve assembly of Fig. 9 will be described assembled with the product container assembly of Fig. 10 and the propellant cartridge of Fig. 12. The assembly may be assembled first with either the product container assembly or the propellant cartridge. Assuming that the propellant cartridge is to be assembled first, the cartridge 90 is placed within the upper length 56 of guide 52. When stopper 93 contacts piercing member 51, force is applied to the top of cartridge 90 as illustrated by arrow *P*. This force causes stopper 93 to be pierced by piercing member 51. Communication of the propellant 91 is thus open from the interior of cartridge 90 through the hollow piercing member 51 and into channel 49 within valve stem 10.

The coupler-aspirator-valve assembly is assembled to the product container assembly by pressing guide 52 downwardly to thereby force flange 64 of product container valve plate 63 into engagement with collar 73 of the product container 70. As this happens, piercing member 67 is caused to pierce gasket

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76. Thus, communication of the product within product sac 71 is open through passage 77, the interior of piercing member 67 and into channel 61 within the product container valve stem 60.

With reference to Fig. 14 of the drawings, the assembled dispenser of Fig. 13 is shown in its operative dispensing position. Cartridge 90 is depressed further in the general direction of arrow P. This force is transferred to valve stem 10 and then to unit 6. Thus, unit 6 is moved downwardly with respect to product container valve stem 60, and valve stem 10 is moved downwardly with respect to the unit 6. As this occurs, gaskets 47 and 59 are flexed, thereby unblocking radial openings 50 and 62, respectively. Therefore, communication is open from channel 61, through radial openings 62, into chamber 58 and flow passage 7. Likewise, communication is open between channel 49, through radial openings 50, and into chamber 46 and flow passage 8. Thus, propellant from cartridge 90 flows through passage 8 and Venturi 9 and aspirates product from product sac 71 and through flow passage 7.

It will be seen that there has been provided, in Figs. 9 to 14, a coupler-aspirator-valve assembly which may readily be detachably assembled with a propellant cartridge and a product container assembly, neither of which need have dispensing valves therein. Thus, the manufacture of product and aerosol assemblies for use in this type system has been greatly simplified.

It is to be understood that the coupler-aspirator-valve assembly could be provided with only one of the product container valve or propellant valve, rather than with both as above described. Such a modification would merely require that the coupler-aspirator unit be adapted to couple to a conventional propellant cartridge valve or product container valve, as described.

With reference now to Fig. 15 of the drawings, the dispensing system of a multi-component product dispenser according to the invention will be generally described.

A product container 1 is adapted to contain multiple component flexible product sacs 2 and 3. Sacs 2 and 3 contain different product components to be dispensed. Sacs 2 and 3 may be made of any suitable material which is compatible with the products to be dispensed. Product container 1 may also be made of any suitable or desirable material such as fiberboard, plastic or metal. Product container valve 4 is seated in valve collar 5. Valve collar 5 is attached to container 1 in any conventional manner. The attachment between collar 5 and container 1 need not be leakproof since both sacs are sealed and contain the product. The valve need only be leakproof but not a pressure seal since container 1 does not house a propellant. Sacs 2 and 3 are in communication with product flow paths in valve 4 in a manner to be described in detail below.

The outlet of product container valve 4 is in communication with a product flow passage 7 in a coupler-aspirator unit 6. Product flow passage 7 and propellant flow passage 8 join in a Venturi nozzle 9 in a manner to be described in more detail below. Propellant flow passage 8 is adapted to communicate with the stem 10 of a conventional aerosol valve 11 of a conventional propellant cartridge 12. Propellant cartridge 12 contains a suitable liquefied gas propellant 13. A dip tube 14 is provided in propellant cartridge 12, since the cartridge will be normally used in the inverted position and only vaporized propellant is desired. If the propellant is adsorbed on a silica type powder the dip tube is not needed. A filtering screen 8a as shown in Fig. 4 can be inserted.

Product container 1 is provided with a guide 15 which is adapted to fit in any conventional manner, such as a snap fit over the top of the product container. Guide 15 acts to guide and laterally support propellant cartridge 12 as shown in Fig. 15. Coupler-aspirator unit 6 extends to and sprays through a hole 16 in guide 15. Container 1 is provided with holes 17 in any suitable location for the purpose of providing air vents within the container. Holes 17 allow equalization of atmospheric pressure within container 1 and around product sacs 2 and 3. Thus, as product is dispensed from sacs 2 and 3, pressure is equalized therearound to ensure continued dispensing.

The general operation of the dispenser shown in Fig. 15 will now be described. The operator grasps the unit generally around guide 15. Force is applied by a finger or thumb in the general direction of arrow P. Since container 1, coupler-aspirator unit 6 and cartridge 12 are aligned, this force actuates and opens both the aerosol valve and the product container valve. Only a force sufficient to open the stronger of these two valves is required. When both valves are opened, the product components from both sacs 2 and 3 are combined and aspirated by the propellant. Thus, the multi-component product is sprayed from nozzle 9.

It is to be understood that any standard propellant cartridge may be used. The cartridge need not be specially designed in terms of quantity for the amount of product. When the propellant is exhausted, it need merely be replaced by another standard propellant cartridge. Additionally, when the products are exhausted and some of the propellant remains, the propellant cartridge may be transferred to a new product dispenser. Thus, it is apparent that the system in accordance with this embodiment of the present invention elimin-

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ates or reduces waste of both product and propellant.

With reference now to Figs. 16 and 17 of the drawings, the operation of the product container valve and the coupler-aspirator unit shown in Fig. 15 will be described in further detail. Valve collar 105 has a central opening 5a therein. Just below opening 5a a flexible annular gasket 121 is supported on an annular valve housing body member 122. A crimp 23 in collar 105 acts to retain body member 122 in place and to hold gasket 21 in place. A second cup-shaped body member 123 of the product valve housing depends form and is supported on the outer periphery of first housing body member 122. Slidably mounted within an upper valve housing chamber 125 in annular body member 122 and internal chamber 127 of cup-shaped body member 123 is a hollow valve stem 126. Crimped between an inwardly extending annular flange part 128 of first annular body member 122 and an upwardly extending ridge 129 on cup-shaped body member 123 is a flexible annular gasket 130.

Radial openings 131 extend from central duct 132 within valve stem 126 to chamber 127. The gasket 130 has the inner periphery thereof obturating the openings 131 and thus serves as a first low pressure obturator.

As shown in Fig. 17, stem 126 has a plurality of longitudinally extending webs 133 defining a plurality of flow passages 134. Radial openings 135 extend outwardly from flow passages 134 at the bottom thereof into annular chamber 125. The gasket 121 has the inner periphery thereof obturating openings 135 and thus serves as a second low pressure obturator. Annular body member 122 has on the inner surface thereof a plurality of longitudinal inwardly extending splines or ribs 136 which connect to flange part 128. Valve stem 126 has a middle portion 137 of enlarged cross section which cooperates with splines 136 to generally provide lateral support for valve stem 126. A spring 138 surrounds stem 126 and is positioned between the bottom of enlarged middle portion 137 and flange part 128, and urges the stem upwardly.

First flexible product sac 2 is secured to a sac adaptor 139. Sac adaptor 139 is secured into cup-shaped body member 123 of the valve housing and opens into a product duct 110. Product duct 140 communicates with passageway 140a formed between the inner wall of cup-shaped body member 123 and flange part 128 of first body member 122 of the product valve housing. Passageway 140a communicates through radial ports 141 between splines 136 with upper valve housing chamber 125. The second flexible product sac 3 is secured to a sac adaptor 142. Sac adaptor 142 is fixed in the wall of cup-shaped body member 123 and opens into internal chamber 124.

To the top of stem 126 is attached coupler-aspirator unit 6. Central duct 132 of stem 126 opens into product flow passage 7 of the coupler-aspirator unit. A reduced diameter end portion 144 of stem 126 is fixed in recess 143 at the bottom of a chamber 145 formed around the stem 126 as an entry recess in coupler-aspirator unit 6. Flow passages 134 of stem 126 communicate with chamber 145. Chamber 145, in turn, communicates through outlet duct 146 with the product flow passage 7 of the coupler-aspirator unit 6. Thus, the product components are mixed in flow passage 7, and are then aspirated into nozzle 9 by propellant flowing through the latter.

Stem 10 of conventional aerosol valve 11 on propellant cartridge 12 is detachably received within recess 147 of coupler-aspirator unit 6 in such a manner that the propellant cartridge is positioned above and aligned with product container valve 4. Recess 147 opens directly into propellant flow passage 8 and into nozzle 9.

The operation of the dispenser shown in Fig. 16 will now be described in detail. As the operator presses down on the propellant cartridge as described above, both the propellant cartridge valve 11 and valve 4 are opened. Force from the propellant cartridge 12 pushed down coupler-aspirator unit 6. This force is then transferred to stem 126. As stem 126 is pushed down into the position shown in Fig. 16, both gasket 121 and gasket 130 are flexed. Therefore, both radial openings 135 and 131, respectively, are open. Communication is then open between flexible product sac 3, chamber 127, radial openings 131, central stem duct 132, and product passage 7. Communication is simultaneously opened between flexible product sac 2, product duct 140, passageway 140a, radial ports 141, upper valve housing chamber 125, radial openings 135, flow passages 134, chamber 145, duct 146 and product passage 7. Propellant is discharged from cartridge 12 through stem 10 of the valve 11 into propellant flow passage 8 (see Fig. 1B) and into nozzle 9. This action aspirates the components of the product through the above mentioned channels and flow passage 7 into nozzle 9. Coupler-aspirator unit 6 extends to and sprays the multiple component product through hole 16 in guide 15.

An alternative arrangement of the product container valve shown in Figs. 15 and 16 will now be described with reference to Fig. 18. Valve collar 105 has a central opening 105a therein. Directly below opening 105a is a flexible annular gasket 121. A first annular valve housing member 122a is supported from collar 105 by crimp 23a therein. Valve housing member 122a supports gasket 121 and holds it in place. A second annular valve housing member 124 is supported by first annular member 122a and is held in place on the inner periphery thereof. A flexible annular gasket 130 is held in place between an upper

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ridge 129 of second annular body member 124 and an inwardly extending ring section 128a of the first annular body member 122a.

A hollow stem 126 is slidably mounted within annular chamber 125 in first annular body member 122a and lower chamber 127 within second annular body member 124. Axial ducts 131a extend from central duct 132 of stem 126 downward and open into lower chamber 127. The gasket 130 has the inner periphery thereof obturating the openings 131, and thus serves as a first low pressure obturator. Stem 126, similarly to the stem shown in Fig. 16, has a plurality of webs which define a plurality of longitudinal channels 134 therein. Stem 126 has an outwardly projecting annular flange 137a on the outer periphery thereof. Channels 134 communicate through radial openings 135 with annular chamber 125. The gasket 121 has the inner periphery thereof obturating the openings 135, and thus serves as second low pressure obturator. Spring 138 surrounds stem 126 and is supported between the bottom of flange 137a and the ring section 128a and urges stem 126 upwardly.

The flexible product sac 2 is secured to sac adaptor 139. Sac adaptor 139 is fixed to annular valve housing member 122a and communicates with annular chamber 125. The flexible product sac 3 is secured to sac adaptor 142. Sac adaptor 142 is fixed to second annular valve housing member 124 and communicates with annular chamber 127. Stem 126 and channels 132 and 134 therein are connected to an communicate with the coupler-aspirator units in precisely the same manner as in the embodiment illustrated in Fig. 16.

Thus, it will be seen that when an operator presses downwardly on the propellant cartridge, thereby moving the coupler-aspirator unit downwardly, and thus causing stem 126 to move downwardly, gaskets 121 and 130 will be flexed downwardly. This will cause openings 135 and 131, respectively, to be opened. Thus, the product in product sac 2 will be in communication with the coupler-aspirator unit through annular chamber 125, openings 135, and channels 134. Likewise, the product in product sac 3 will be in communication with the coupler-aspirator unit through lower chamber 127, ducts 131a and central stem duct 132.

With reference now to Fig. 19, a further embodiment of the product container valve will be described. The embodiment of Fig. 19 is similar to the emobdiment of Fig. 18, with the exception of the angles of alignment of sac adaptors 239 and 242, and with the further exception that only a single valve housing 222 is provided. Flexible annular gasket 221 is held in place between collar 205 and valve housing 222 in a manner similar to that of the embodiment of Fig. 18. Flexible annular gasket 230 is held in place between a ridge 222b of valve housing 222 and a retaining ring 228. Retaining ring 228 is held in place and prevented from upward movement by ridge 22a on the inner wall of valve housing 222. The flexible product sac 2 is secured to sac adaptor 239, which is held in place in valve housing 222 to communicate with an upper chamber 225 therein. The flexible product sac 3 is secured to sac adaptor 242, which is secured within valve housing 222 and communicates with a lower chamber 227 therein.

Hollow valve stem 226 is slidably mounted within chambers 225 and 227. Duct openings 231 extend from central duct 232 within stem 226 into chamber 227. Radial openings 235 extend from longitudinal passages 234 within stem 226 into chamber 225. Gasket 230 has the inner periphery thereof obturating the openings 231 and thus serves as a first low pressure obturator. Gasket 221 has the inner periphery thereof obturating the openings 235 and thus serves as a second low pressure obturator. Spring 238 acts to bias stem 226 in an upwardly direction. It is noted in Fig. 19 that sac adaptors 239 and 242 are positioned within valve housing 222 in an angular manner. This arrangement offers the significant advantage that the flow path of the product from product sac 2 is in a substantially straight vertical line from sac adaptor 239, through chamber 225 to passages 234. Thus, turbulence of the product within chamber 225 is reduced. This markedly reduces the time required for product flow. This arrangement offers the further advantage over the arrangement shown in Fig. 18 in that the sac adaptors need not be crowded around the collar 205. This provides much more freedom for the flexible sacs and helps to insure that the sacs are not prematurely closed. Product flow from sacs 2 and 3 through stem 226 is brought about in the same manner as product flow from the sacs in the embodiment of Fig. 18.

In the embodiments of this invention thus far described, all of the product components have been enclosed in flexible product sacs. In such arrangement as previously discussed with regard to Fig. 15, the product container is provided with various holes 17 therein to ensure an equalization of pressure within the product container to further provide for continued dispensing of the products from the sacs. The valve collar need not be attached in a leakproof manner in such embodiments. However, as also previously mentioned, it is possible to enclose one of the product components within the product container itself, rather than in a flexible product sac. However, it is manifest that if such arrangement is made, the pressure equalization holes may not be provided in the product container itself. Further, the attachment of the valve collar must be leakproof.

Therefore, with reference now to Fig. 20,

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an embodiment of the present invention will be described wherein one of the products is located within the product container 401 itself and means are provided for pressure equalization within the product container. The embodiment of Fig. 20 is similar to the embodiment shown and described with reference to Fig. 18. However, instead of a sac adaptor being fitted into outer valve housing member 322, a dip tube 339 is fitted therein. Dip tube 339 communicates with upper chamber 325. Collar 305 sealed to contain 301 by any conventional means to provide a leak-proof seal. The outer valve housing member 322 is supported by an downwardly extending annular flange 305a of collar 305. Gasket 321 is held in place between collar 305 and valve housing member 322. An inner valve housing member 324 is set in and is supported by outer valve housing member 322. Gasket 330 is supported between the upper rim of inner valve housing member 324 and the lower face of inwardly extending ring section 328 of outer valve housing member 322. Flexible product sac 3 is secured to sac adaptor 342, which is then secured within inner valve housing member 324, and which communicates with chamber 327.

Slidably mounted within chambers 325 and 327 is hollow valve stem 326. Radial openings 331 extend from central duct 332 of stem 326 into chamber 327. Radial openings 335 extend from longitudinal passages 334 of stem 326 into upper chamber 325. Gasket 330 has the inner periphery thereof obturating the openings 331, and thus serves as a first low pressure obturator. Gasket 321 has the inner periphery thereof obturating the openings 335, and thus serves as a second low pressure obturator. Annular depending flange 305a has a slot 305b therein. It will be apparent that as the unit is actuated and stem 326 is depressed, gasket 321 is moved downwardly. This, of course opens communication between the product in the container 301 through dip tube 339 into chamber 325 through openings 335 and into passages 334. Simultaneously, however, gasket 321 is moved away from annular ridge 305c of collar 305 and there is then communication between the atmosphere above collar 305 and the interior of container 301 through opening 305b. Thus, as product is aspirated from the interior of container 301, air of ambient pressure is introduced into container 301 to equalize the pressure therein thus to ensure continued dispensing of product therefrom. Conversely, upon release of the valve stem 326 a seal is again created when projection 305c engages gasket 321. It is to be understood that the dip tube 329 could be secured to inner valve housing member 324 in place of sac adaptor 342, and that a sac and sac adaptor could then be connected to the outer valve housing member 322. It is to be further understood that a dip tube could be used in place of either of the sac adaptors 239 or 242 shown in Fig. 19, or either of the sac adaptors 139 or 142 shown in Fig. 16. All that would be required is that the air return device shown in Fig. 20 be provided in the valve structure of Fig. 19 or Fig. 16, and that the holes 17 be closed. It is to be further understood that any of the embodiments could employ the use of two or more dip tubes, rather than one dip tube and one or more sacs. This would merely require that the product container be partitioned to provide mutually isolated compartments.

With reference now to Fig. 21 of the drawings, a further embodiment of the present invention will be described, wherein a inner flexible product sac 403 is connected to valve 401 and contained on the inside of an outer flexible product sac 402. Flexible annular gasket 421 is held in place between collar 405 and the product valve housing 422 in a manner similar to that of the previous embodiments. Flexible product sac 403 is blow moulded in a conventional manner to provide an integral rigid adaptor portion 442. The adaptor portion 442 is held in a lower recess of valve housing 422. Flexible product sac 402 is also blow moulded or injection blow moulded in a conventional manner to provide an integral rigid adaptor portion 439. Adaptor portion 439. Adaptor portion 439 fits around and is held in place by a bead 422a on the periphery of valve housing 422. Thus, it will be seen that sac 403 is positioned within sac 402. It will therefore be further apparent that sac 403 must be compatible with both the product component to be contained within sac 402 and the product component to be contained within sac 403.

Flexible annular gasket 430 is held in place between the upper rim 442a of adaptor portion 442 and an inwardly extending ring section 428 of valve housing 422.

Hollow stem 426 is slidably mounted within chamber 425 of valve housing 422. Duct openings 431 extend from central duct 432 within stem 426 downwardly and establish communication with the interior of sac 403. Radial openings 435 of channels 434 within stem 426 communicate with chamber 425. Gasket 430 has the inner periphery thereof obturating the openings 431 and thus serves as a first low pressure obturator. Gasket 421 has the inner periphery thereof obturating the openings 435 and thus serves as a second low pressure obturator. A spring 438 acts to bias stem 426 in an upward direction.

Thus, it will be seen that when an operator presses downwardly on the propellant cartridge, thereby moving the coupler-aspirator unit downward, and thus causing stem 426 to move downwardly, gaskets 421 and 430 will be flexed downwardly. This will cause openings 435 and 431, respectively, to be opened. Passage 440 provided within the wall of valve

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housing 422 establishes communication between the interior of product sac 402 and chamber 425. Thus, the product in product sac 402 will be in communication with the coupler-aspirator unit through passage 440, chamber 425, openings 435, and channels 434. Likewise, the product in product sac 403 will be in communication with the coupler-aspirator unit through openings 431 and central duct 432.

With reference now to Fig. 22 of the drawings, a modification of the embodiment shown in Fig. 21 will be described. The dispenser shown in Fig. 22 is similar to that of Fig. 21, but instead of an inner flexible product sac, a dip tube 542 is friction-fitted into the inner open end of valve housing 522. Adaptor portion 539 of blow-moulded or injection blow-moulded flexible product sac 502 is attached to the outer periphery of valve housing 522. The bottom of sac 502 is provided with a moulded sleeve portion 539a, through which dip tube 542 extends. Flexible annular gasket 521 is held in place between collar 505 and the upper ring valve housing 522 and annular inset member 524 in a manner similar to that shown in Fig. 20. Depending annular flange 505a of collar supports valve housing 522. Flexible annular gasket 530 is held in place by an inner shoulder 522a between valve housing 522 and a ring portion 528 of annular inset member 524.

A valve stem 526 is slidably positioned within valve housing 522 and inset members 524. Stem 526 operates in precisely the same manner as the stem in Fig. 21. Thus, when the unit is actuated and the stem 526 is depressed, the product component contained within the product container (not shown) is in communication with central duct 532 through dip tube 542, lower chamber 527, and duct openings 531. The product component contained within sac 502 is in communication with passages 534 via passages 540 in valve housing 522, parts 541 in inset member 524, upper chamber 525, and radial openings 535. Additionally, as stem 526 is depressed, the interior of the product container is placed in communication with the atmosphere through slot 505b in depending flange 505a, to equalize the pressure within the product container and to insure continued dispensing therefrom.

A further modification of this embodiment of the present invention is illustrated by the dashed lines of the second flexible product sac 503. Thus, the second product component may be enclosed in sac 503, rather than in the product container itself. Sac 503 would be fitted around the outer, lower end of dip tube 542. The product component within sac 503 would be dispensed therefrom in precisely the same manner as above described. Of course, it would not be necessary if sac 503 were to be employed to provide the air return slot 505b within the valve. It would manifestly be possible to merely provide openings at appropriate locations within the outer container itself.

In the various embodiments of this invention thus far described, the product components have been mixed together in the first product flow passage within the coupler-aspirator unit immediately upon their being discharged from the product container valve stem. However, it is advantageous, in certain cases, to delay mixing of the various product components until actually aspirated through the nozzle of the coupler-aspirator unit. Such an arrangement would be particularly important in a situation where the product components should not be mixed until actually sprayed. With reference then to Figs. 23 to 25, a coupler-aspirator unit is described wherein the multiple product components are not mixed until they are actually sprayed from the nozzle.

As shown in Figs. 23, 24 and 25, coupler-aspirator unit 606 is adapted detachably to receive the stem of a conventional propellant cartridge within a recess 646. Recess 646 communicates with a vertical section 607a of a propellant flow passage. Section 607a terminates in a horizontal section 607b of the propellant flow passage which opens into the Venturi of nozzle insert 609. Coupler-aspirator unit 606 is also adapted to be coupled to a product valve stem 626 having isolated product flow passages 632 and 634 therein. A first product component flow path extends through central duct 632 of valve stem 696 into a vertically extending duct section 633a of a first product flow passage within the coupler-aspirator unit 606. A second product component flow path extends through passages 634 to vertical duct section 635 of a second product flow passage within the coupler-aspirator unit. Section 633a communicates with a horizontal duct section 633b of the first product component flow path within the coupler-aspirator unit. Section 635a communicates with a horizontal section 635b of the second product component flow path within the coupler-aspirator unit. Sections 635b and 633b extend horizontally through the coupler-aspirator unit 606 and terminate at a recess 636 housing the nozzle insert 609.

Dividing walls 637 are provided integrally of the coupler-aspirator unit 606 and extend in a generally radial direction into recess 636 and abut against the nozzle insert 609. Dividing walls 637 thus divide chamber 636 into two separate product chambers 636a and 636b in recess 636. Section 633b of the first product component flow path communicates with product chamber 636b, and duct section 635b of the second product component flow path communicates with product chamber 636a. Radial parts 638 extend form product chamber 636a into the interior of nozzle 609 and radial

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parts 639 extend from product chamber 636b into the interior of nozzle 609.

Thus, it will be apparent that the various product components are not mixed until they actually reach the interior of nozzle 609. The coupler-aspirator unit shown in Figs. 23—25 of course otherwise operates in precisely the same manner as the coupler-aspirator units discussed in the previous embodiments.

Although each of the embodiments of the present invention thus far discussed discloses the use of only two product components, it is to be understood that the present invention contemplates the use of three or more such components. This alteration could be made in any of the disclosed embodiments by providing additional product sacs, additional sac adaptors, additional product passages and additional obturating means. One such modification will be described now with reference to Fig. 26, wherein a product container valve modified to have three product passages is adapted to be coupled to a coupler-aspirator unit having three product flow passages similar to the coupler-aspirator unit shown in Figs. 23 to 25. Product container valve stem 726 is shown in dashed lines and has three product flow passages, 730, 732 and 734. Stem product flow passage 730 is adapted to communicate with vertical section 731a of a first product flow passage within the coupler-aspirator unit 706, stem product flow passage 732 is adapted to communicate with vertical section 733a of a second product flow passage within the coupler-aspirator unit, and stem product flow passage 734 is adapted to communicate with vertical section 735a of a third product flow passage within the coupler-aspirator unit. Section 731a opens into a horizontal section 731b of the first product flow passage, section 733a opens into a horizontal section 733b of the second product flow passage, and section 735a opens into a horizontal section 735b of the third product flow passage. The product flow passages within the coupler-aspirator unit are adapted to mix the various product components within the nozzle of the coupler-aspirator unit in a manner similar to that described with reference to Figs. 23 to 25. The embodiment shown in Fig. 26 in other respects operates in the same manner as the previously described embodiments, the only difference being that there are three, rather than two, product components.

With reference now to Fig. 27 of the drawings, the dispensing system of yet another preferred embodiment of the invention will be generally described. A protective product container 1 is adapted to contain multiple component flexible product sacs which may be made of any suitable material to contain the product components. Product container 1 may be made of any suitable material such as, fibreboard, plastics or metal since it merely serves to protect the sacs. Product container valve 1 is seated in valve collar 5. Valve collar 5 is sealed to container 1 in any conventional manner. Sacs 2 and 3 are in communication with product flow paths in valve 4 in a special manner to be described in detail below. The outlet of product container valve 4 is in communication with a first flow path 7 in a coupler-aspirator unit 6. First flow path 7 and a second flow path 8 join in a Venturi nozzle 9. Second flow path 8 is adapted to communicate with stem 10 of a conventional aerosol valve 11 of a conventional propellant cartridge 12. Propellant cartridge 12 contains a suitable liquefied gas propellant 13. A dip tube 14 is provided in propellant cartridge 12, since the cartridge will be normally used in the inverted position and vaporized propellant only will be withdrawn. Cartridge 12 is generally aligned with product container 1.

Product container 1 is provided with a guide 15 which is adapted to fit in any conventional manner, such as a snap fit, over the top of the product container. Guide 15 acts to guide and laterally support propellant cartridge 12, as shown in Fig. 27. Coupler-aspirator unit 6 extends to and sprays through a hole 16 in guide 15. Container 1 is provided with holes 17 in any suitable location for the purpose of providing air vents within the container. These holes 17 allow equalization of atmospheric pressure within container 1 and around product sacs 2 and 3. Thus, as product is dispensed from sacs 2 and 3, pressure is equalized therearound to ensure continued dispensing.

With reference now to Figs. 28 to 31 of the drawings, the operation of the product container valve and the coupler-aspirator unit generally described in Fig. 27 will be described in further detail. Valve collar 5 has a central opening 5a therein. Just below opening 5a, a flexible annular gasket 821 is supported on a valve housing 822. A crimp 23 in collar 5 acts to retain valve housing 822 in place and to hold gasket 821 in place. Within valve housing 822 is an annular chamber 824. Extending upwardly from the center of a portion base 825 of valve housing 822 within opening 5a and around stationary stem 826 is an annular moveable stem 827. Moveable stem member 827 is composed of an annular tubular member 828 which is surrounded by an annular stem member 829. A second flexible annular gasket 830 is positioned and held between annular tube 828 and annular stem member 829. Thus, annular tube 828 acts as a retaining ring to hold gasket 830 in place. Annular tube 828 is held in place by a snap portion 829b of annular stem member 829.

Axial ducts 831 extend from central duct 832 within stationary stem 826 into passage 833 within the interior of annular tube 828. The gasket 830 has the inner periphery thereof obturating the openings of ducts 831 and

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thus serves as a first low pressure obturator. A spring 837 surrounds stationary stem 826 and is positioned between the bottom of annular stem member 829 and the upper surface of base portion 825 of valve housing 822 and urges the movable stem 827 upwardly.

A dual sac adaptor 838 includes a base portion 839 and two adaptor tubes 840 and 841. Dual sac adaptor 838 is adapted to be inserted within an opening in a flexible sac. The edges of the opening in the sac are then sealed to the upper surface of base portion 839 to provide a seal 842. Simultaneously, the centre of the sac is sealed to the portion of the base 839 between the adaptor tubes 840 and 841 to provide an upper seal 843, a lower seal 844, and two individual isolated product sac chambers 802 and 803. The dual sac adaptor is adapted to be fitted into the base 825 of valve housing 822 in such a manner that adaptor tube 840 communicates with annular chamber 824 and adaptor tube 841 communicates with central duct 832 within stationary stem 826.

It is to be understood that the scope of the present invention encompasses an arrangement whereby individual sac adaptors are employed, rather than the dual sac adaptor 838. Such modification would require only the provision of separate sac adaptors and separate flexible product sacs.

At the top of movable stem 827 is attached coupler-aspirator unit 6. Hollow passage 833 within annular tube 828 opens into a first flow passage 7 of the coupler-aspirator unit. A reduced diameter sleeve portion 845 of the coupler-aspirator unit 6 projects into a downwardly open recess 846. Coupler-aspirator unit 6 has a depending annular flange 806 about recess 846. As shown in Fig. 31 the flange 806 bears on its inside wall a plurality of longitudinally extending radially projecting ribs 834 defining a plurality of flow passages 835. Flange 806 and outwardly projecting flange 829a of annular stem member 829 act to provide radial opening 836 at the lower end of flow passages 835. The gasket 821 has the inner periphery thereof obturating openings 836 and thus serves as a second low pressure obturator. Flow passages 835 communicate with flow passage 7 of coupler-aspirator unit 6 through chamber 846. Thus, the product components are mixed in flow passage 7 and are then introduced into nozzle 9 and sprayed therethrough by the propellant.

The operation of the dispenser of the Figs. 28 to 31 embodiment of the present invention will now be described in detail. As the operator presses down on the propellant cartridge as described above, both the propellant cartridge valve 11 and the product container valve 4 are opened. Force form the propellant cartridge 12 pushes down coupler-aspirator unit 6. This force is transferred to movable stem member 827. As movable stem member 827 is pushed down into the position shown in Fig. 29 both gasket 821 and 830 are flexed. Therefore, both openings 836 and 831, respectively, are opened. Communication is then open between flexible product sac 2, adaptor tube 840, chamber 824, openings 836, longitudinal passages 835, chambers 846, and first flow passage 7. Communication is opened between flexible product sac 3, adaptor tube 841, central stem duct 832, axial ducts 831, flow passage 833, and first flow path 7. Vaporized propellant is discharged from cartridge 12, down dip tube 14, through stem 10, into second flow passage 8 and thus into nozzle 9. This action aspirates the components of the product through the above-mentioned paths. Coupler-aspirator unit 6 extends to and sprays the multi-component product through hole 16 in guide 15.

The flexible sacs above described are preferably of the thin-walled type, and have great flexibility. The sacs may be made of any suitable, especially of collapsible and/or contractible material which is compatible with the product component used therein. For instance, the sac may be made from any suitable laminate material. Even further, a different laminate material may be used in each compartment of the single sac. This would enable the enclosure of separate materials which are not compatible with any single laminate material.

Thus, it will be seen that there has been provided a multi-component product dispenser which may be manufactured inexpensively by manufacturers not specialized in aerosol dispensers. The dispenser of this invention may manifestly provide greatly improved commercial exploitation of products which heretofore have not been distributed in aerosol form. The unit as described above may be manufactured and adapted to be later combined with a conventional aerosol propellant cartridge. The provision of this type dispenser eliminates a great many manufacturing problems. The product container need not be pressure sealed or leakproof. The product unit need not be shipped or handled under aerosol regulations since the unit contains no aerosol cartridge or propellant. The waste of either the propellant or the product, heretofore unavoidable, is eliminated.

Furthermore, it will be seen that there has been provided by the last-described embodiments of the present invention a multi-component product dispenser wherein an integral dual sac adaptor may be easily and inexpensively inserted within the product container valve, and wherein separate isolated product sacs may be sealed to the dual sac adaptor from a single flexible sac.

Although the illustrated embodiment discloses the use of two product components, it is to be understood that the present inven-

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tion contemplates the use of three or more such components. Such alteration could be made in the disclosed embodiment merely by providing additional product sac chambers, additional adaptor tubes, additional product passages within the product valve, and additional obturating means.

Additionally, while in the embodiment above described the propellant cartridge is located above and aligned with the product container, it is to be understood that the reverse is also possible. That is, the product container could be located above and aligned with the propellant cartridge.

Furthermore, although the embodiments of multi-component product dispensers above-described have employed the use of the propellant valve which is actuated upon depression, it is to be understood that other conventional propellant valves may be used. For instance, it will be apparent to those skilled in the art that a tilt action propellant valve could be used in the assembly of these multi-component product dispensers.

Even further, though the description of the present invention shows the mixing of the product components in flow passage 7 of the coupler-aspirator unit, it is to be understood that the mixing of the product components can be delayed until the actual nozzle of the coupler-aspirator unit. Such change would merely require the provision of separate flow passages within the coupler-aspirator unit to the nozzle for each of the product components.

WHAT WE CLAIM IS:—

1. An aerosol dispenser comprising a) a product container having at least one compartment housing a product to be dispensed and bearing axial product outlet means, b) a detachably mounted aerosol propellant cartridge containing an at least partially liquefied gas under pressure and having propellant outlet means directed toward and generally aligned with the product outlet means, and disposed so as to be above the later in the normal orientation of the dispenser, c) a coupler-aspirator unit disposed between and connecting the product outlet means and the propellant outlet means, the said unit comprising a product aspirating and discharging nozzle, including a propellant-accelerating convergent tubular chamber, for spraying product from said container, each of the product outlet means and propellant outlet means comprising a valve for controlling the flow of product and propellant, respectively, through the respective outlet means, the said unit being connected at spaced apart faces thereof to the two valves and having in its interior separate passages leading from each of the valves to the discharge nozzle, the said passage for the product communicating with the discharge nozzle at or downstream of the narrower end of said tubular chamber, and d) guide means holding the product container and the propellant cartridge in generally aligned relationship displaceably relative to each other and to said unit, against the pressure of at least one return spring means, the arrangement being such that displacement of the propellant cartridge and the product container relative to each other and to said unit causes the valves to open for the flow of product and propellant therethrough and through the respective passages in the coupler aspirator unit to the discharge nozzle, the propellant flowing through the nozzle producing a reduced pressure in the product container and thereby aspirating product to be dispensed into the nozzle.

2. A dispenser according to claim 1 wherein said aspirating nozzle is a Venturi nozzle.

3. A dispenser according to claim 1 or 2 whercin the guide means are rigidly mounted on the product container and the propellant cartridge is axially displaceable in said guide means.

4. A dispenser according to claim 1 wherein the guide means are rigidly connected to the product container and the propellant cartridge and coupler-aspirator unit are tiltable in the guide means, the valve being operable by tilting the propellant cartridge to permit flow of propellant and product, respectively, toward and through the discharge nozzle.

5. A product dispenser according to any one of claims 1 to 4, wherein the discharge nozzle comprises, in addition to said convergent chamber, a narrow Venturi duct and a divergent discharge chamber to wider end of the convergent chamber being connected to a passage for propellant, an annular product feeding chamber about the Venturi duct, and radial inlet conduits connecting the annular product feeding chamber and Venturi duct with each other, the product passage being connected to the annular product feeding chamber.

6. A dispenser according to any one of claims 1 to 5 wherein the passage for propellant is connected to a narrower duct which opens into a mixing chamber of enlarged diameter, the product passage opens into said mixing chamber, and the mixing chamber opens into a nozzle mouth of outwardly divergent cross section opening in the wall of the coupler-aspirator unit.

7. A dispenser according to any one of claims 1 to 6 wherein the product container comprises at least one flexible, collapsible and/or contractible sac for containing a product component and a sac adaptor for joining the sac to a housing of the valve of the product outlet means.

8. A dispenser according to claim 7, where-

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in a single product sac is provided in the product container.

9. A dispenser according to claim 7 wherein the product container comprises at least two separate product compartments for different product components, and wherein the valve of the product outlet means comprises separate duct means for the flow of each of the product components separately from each product compartment of the product container, respectively, via a valve stem into the coupler aspirator unit.

10. A dispenser according to claim 7 or 9 wherein the product container constitutes an outer mantle for the product sac or sacs and is provided with openings for admitting outside air, the sac or sacs being in sealing engagement with the valve housing to prevent the entry of outside air into the interior thereof.

11. A dispenser according to any of claims 7, 9 and 10 having two or more product sacs, wherein each sac has a sac adaptor joined to the valve housing.

12. A dispenser according to claim 9, wherein the product container sealingly engages the valve housing of said product outlet means, and wherein a dip tube extends from the valve housing into the space in the product container outside the product sac or sacs.

13. A dispensed according to any one of claims 10—12 and having two product sacs inside the product container, one sac being disposed inside the other and there being provided a common adaptor having separate channels for the product component from each sac and leading to separate compartments in the valve housing to which said adaptor is jointed.

14. A dispenser according to claim 13 wherein two gaskets are provided in the product valve housing, and wherein the valve housing includes a member having an inwardly extending flange part engaged by one of the gaskets, the other gasket being disposed between the valve housing and collar means provided on the product container, both gaskets engaging a valve stem of the valve and controlling separate flow paths for the two product components from the sacs through the valve.

15. A dispenser according to any one of claims 9, 11 and 12 wherein the passage for product in the coupler-aspirator unit comprises a single flow passage to the discharge nozzle, in which flow passage the product components are mixed with each other.

16. A dispenser according to any one of claim 9, 11 and 12 wherein the passage for product in the coupler-aspirator unit comprises mutually isolated flow passages leading the discharge nozzle, one of these flow passages being provided per product component, the components being mixed only in the discharge nozzle.

17. A dispenser according to any of claims 9 to 12, 15 and 16 wherein the valve housing of the product outlet means comprises an annular portion a base portion enclosing a housing chamber and a stationary stem having a central duct wherein communicating with the interior of one of the sacs, the stationary stem extending from the base into the housing chamber, the valve stem of the product outlet means comprising a movable stem member slidably mounted within said housing chamber around the stationary stem, and an internal annular flexible gasket mounted in said movable stem member and engaging the stationary stem to obturate the duct in the stationary stem when the dispenser is not in use.

18. A dispenser according to claim 17 wherein the coupling means of the coupler-aspirator unit for connection to the product outlet means have a central recess and product component duct means separate from the recess communicating with the housing chamber, both the central recess and the duct means communicating with the discharge nozzle via a common passage means or via separate passage means, and a unitary sac adapter having a plurality of tubes one of which communicates with the central recess, and the remaining tube or tubes with the product component duct means, the other ends of each of these tubes being connected to different product compartments in the product container.

19. A dispenser according to claim 18 wherein the movable stem member comprises a flange portion, integral with or separable from a portion of the stem member housing the internal gasket, which flange portion supports an annular flexible gasket mounted on the outer rim of the annular valve housing portion and obturating the duct means of the coupler-aspirator unit, when the dispenser is not in use.

20. A dispenser according to claim 18 or 19 wherein the product container holds a unitary product sac of flexible, collapsible and/or contractible material, the sac having separate chambers each of which holds a different component, each of the sac chambers serving as a product compartment, one of which chambers communicates through the adjoining valve housing with the central recess and each of the remaining sac cham-

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bers via different flow paths with a different duct means in the coupler-aspirator unit.

21. A dispenser according to claim 1 and substantially as hereinbefore described with reference to the accompanying drawings.

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1340432 COMPLETE SPECIFICATION
16 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig.1

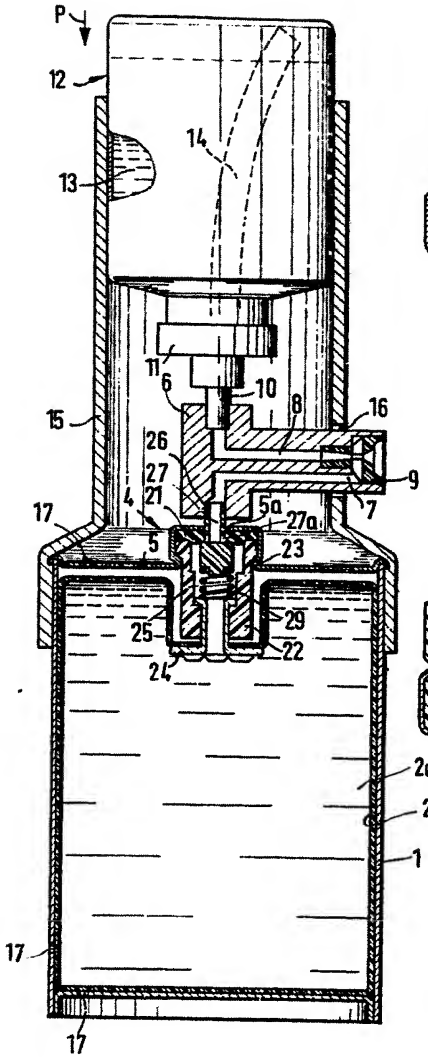
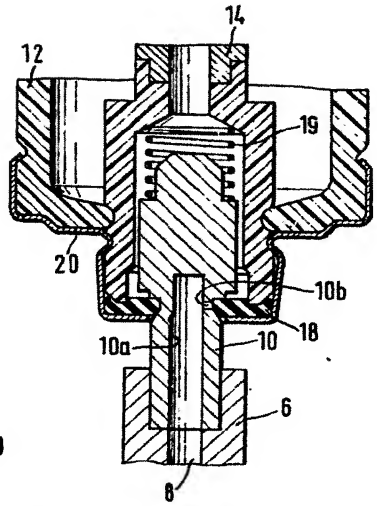


Fig.1A



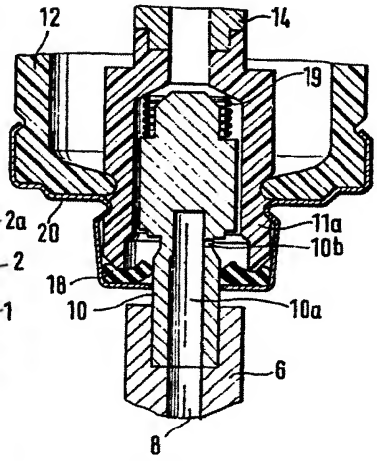


Fig.1B

BNSDOCID: <GB_____1340432A__I_>

Fig.2

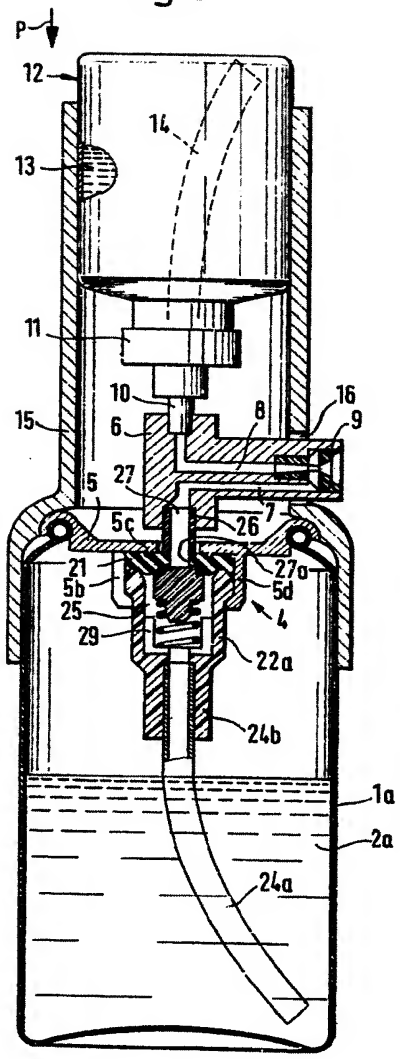


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Fig.3

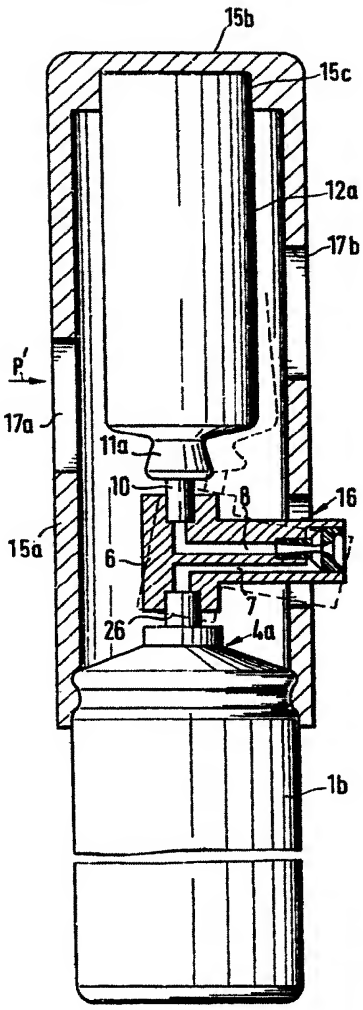

Fig.4

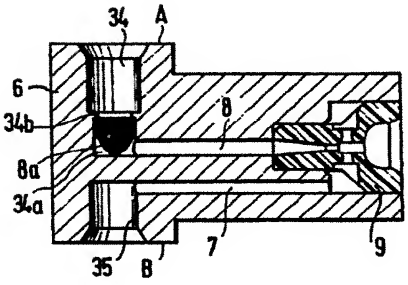

Fig.5

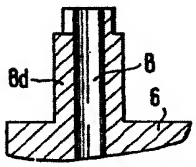

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Fig.6

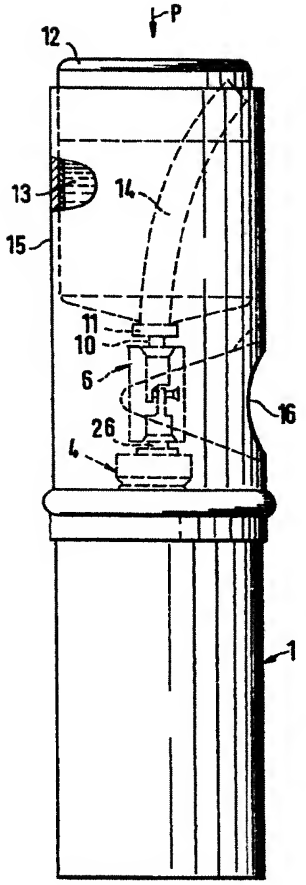

Fig.7

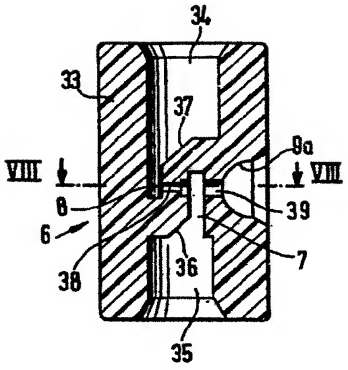

Fig.8

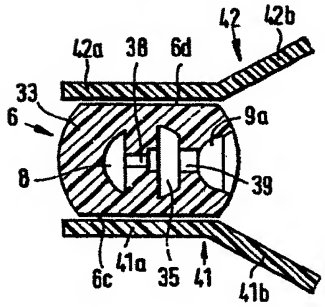

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Fig.9

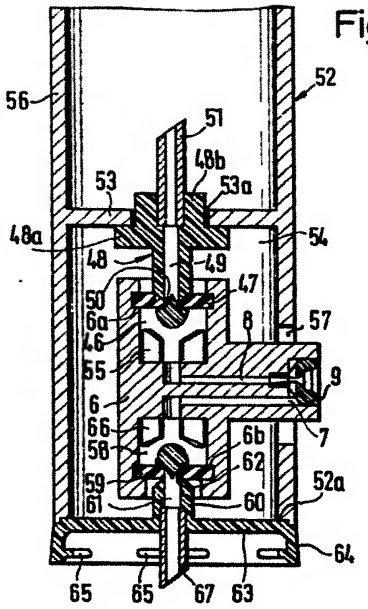

Fig.11

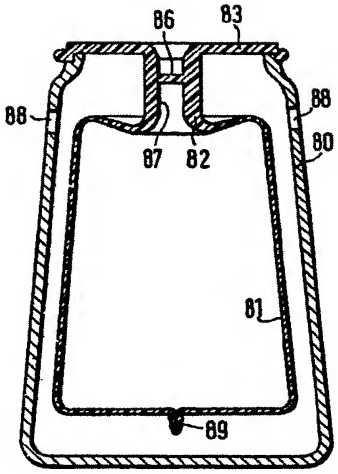

Fig.10

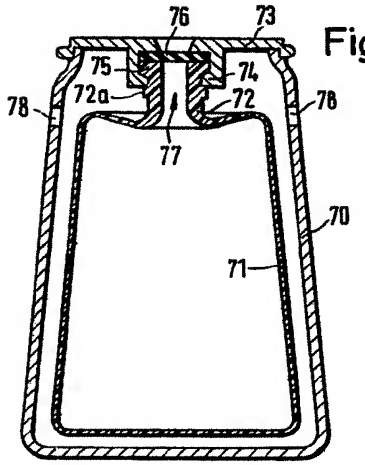

Fig.12

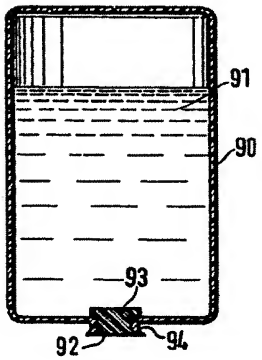

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Fig.13

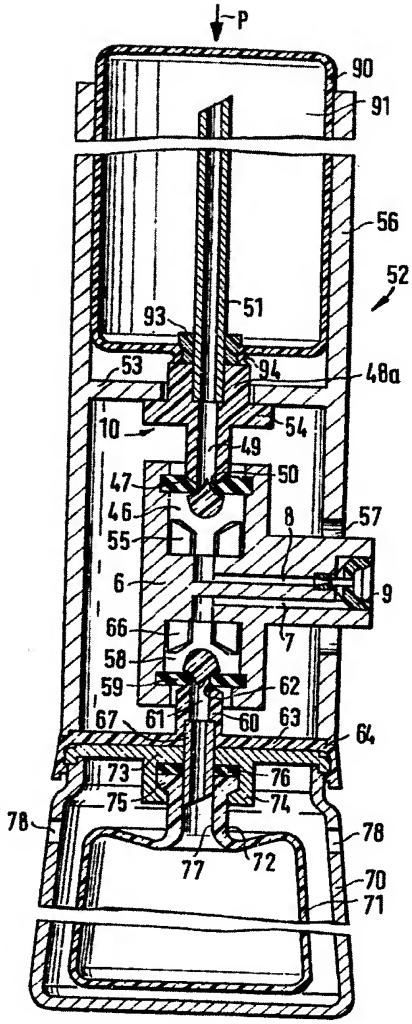

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Fig.14

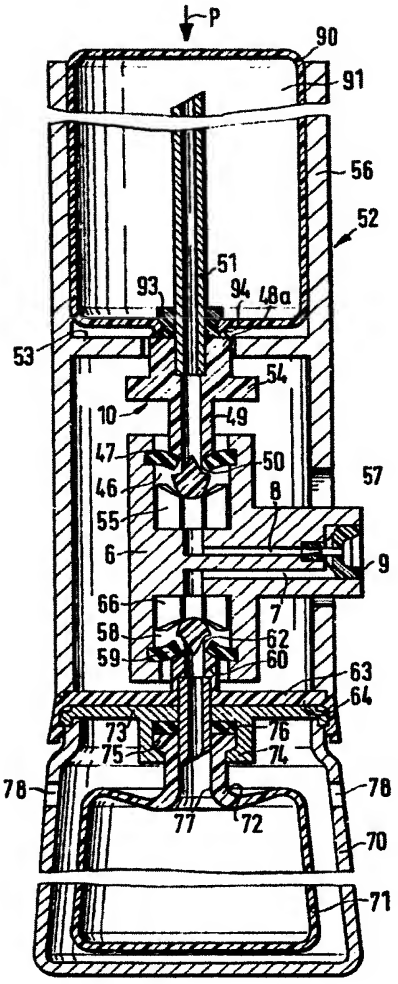

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Fig.15

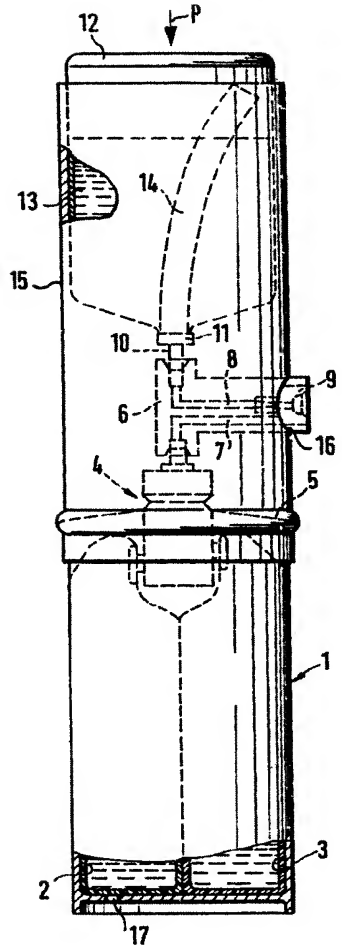

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Fig.16

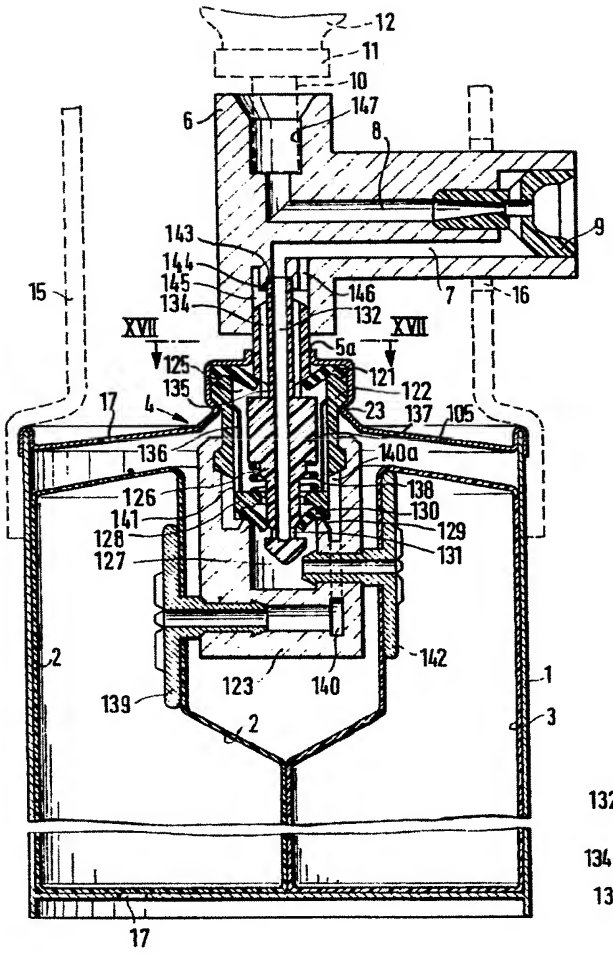

Fig.17

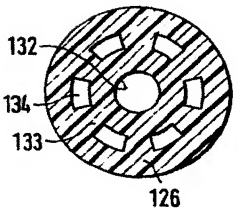

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Fig.18

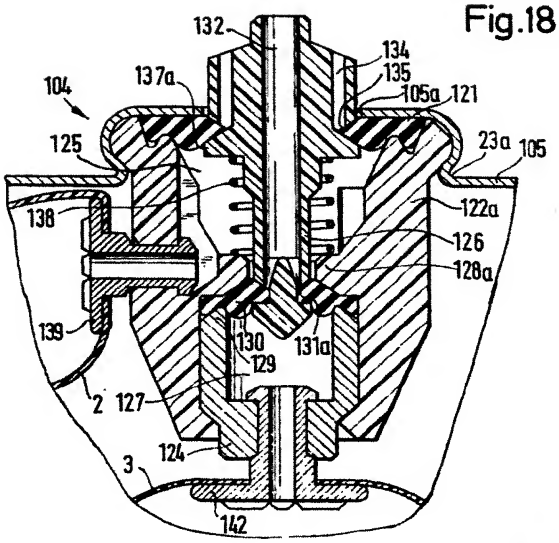

Fig.19

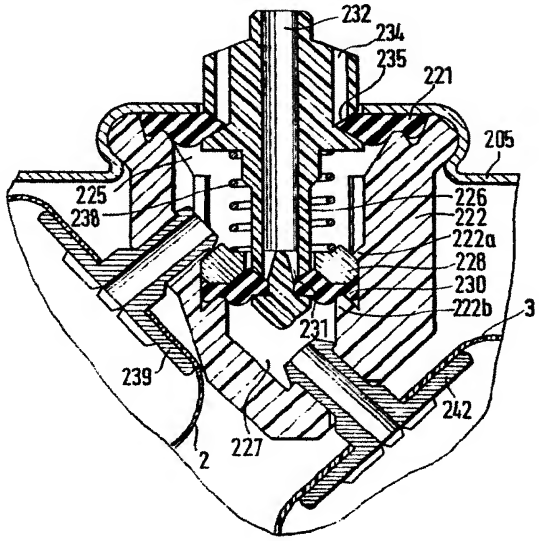

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Fig.20

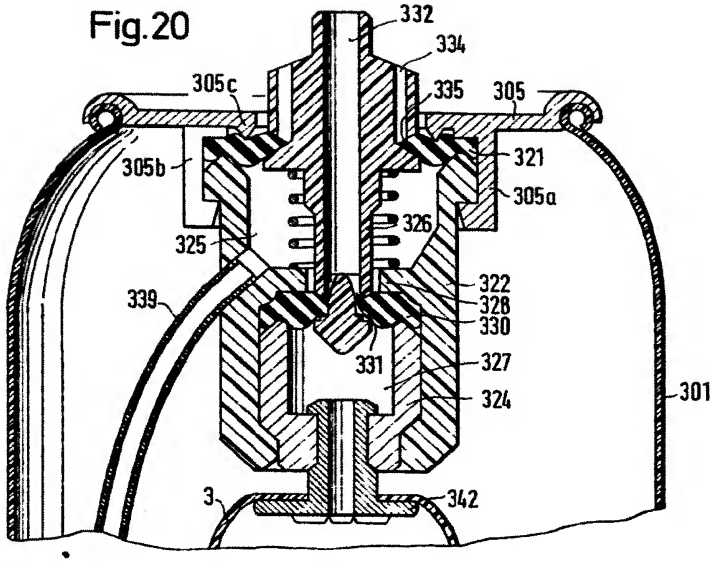

Fig.21

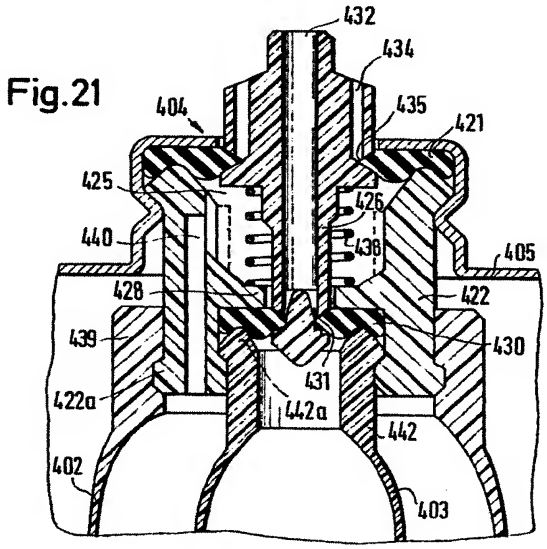

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Fig.22

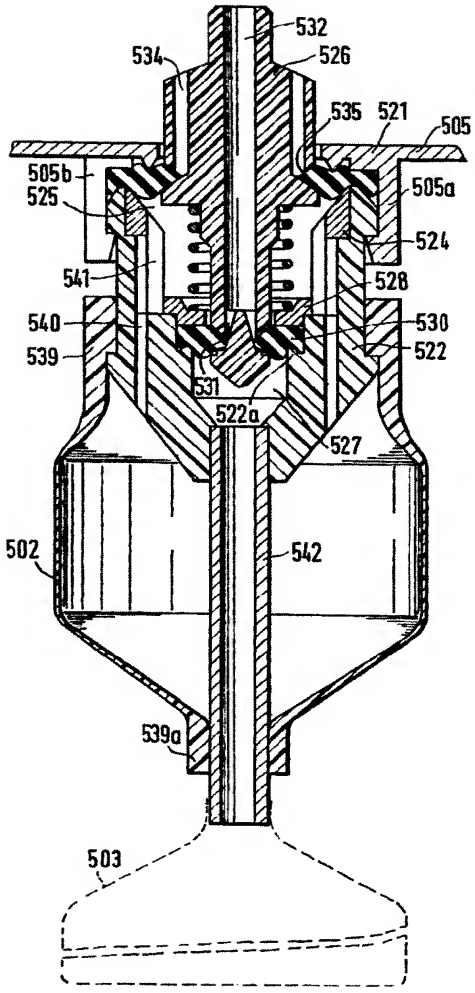

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Fig.23

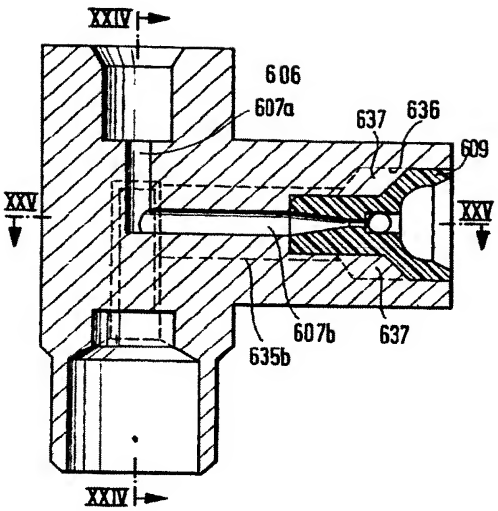

Fig.24

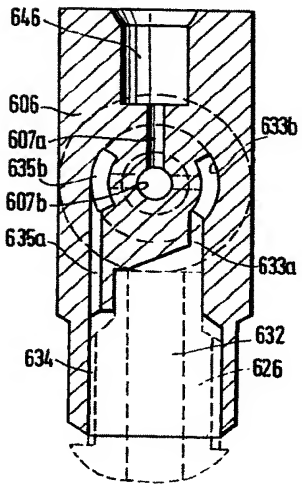

Fig.25

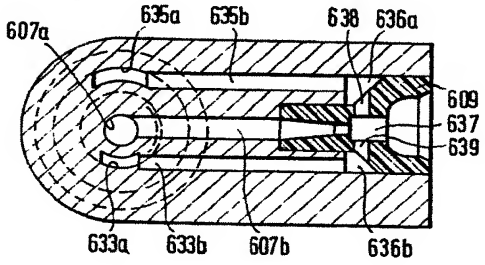

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Fig.26

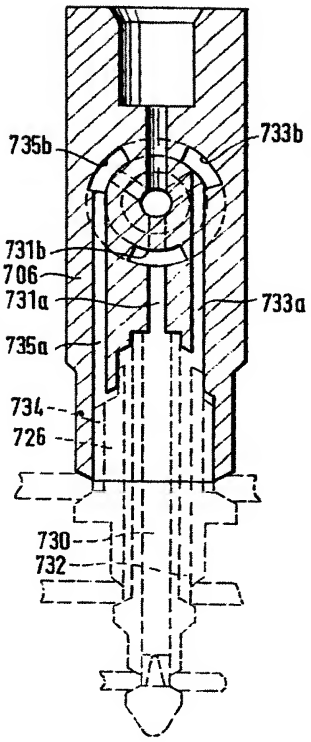

Fig.27

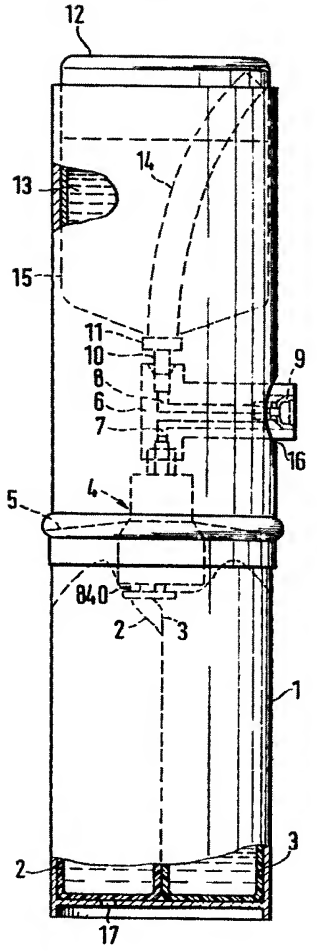

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Fig.28

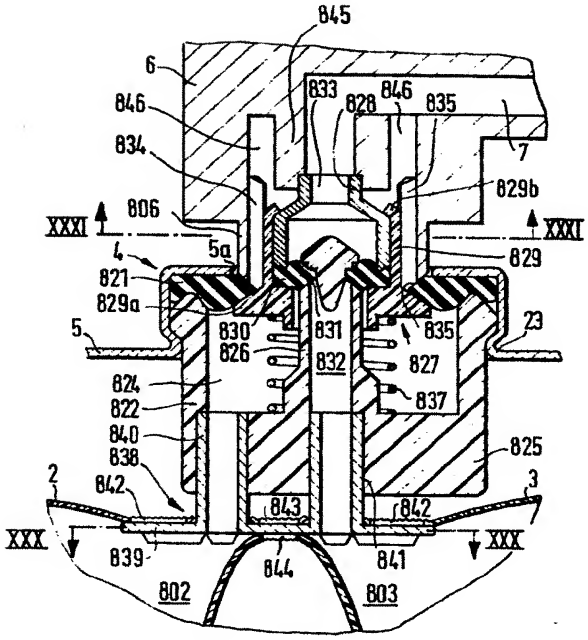

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Fig. 29

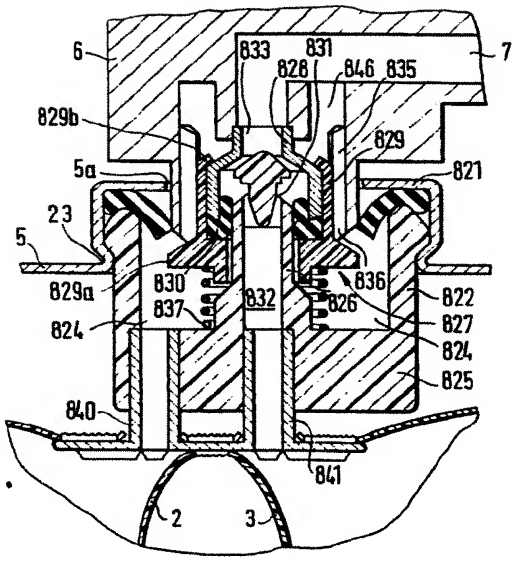


Fig. 30

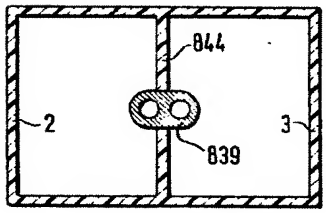
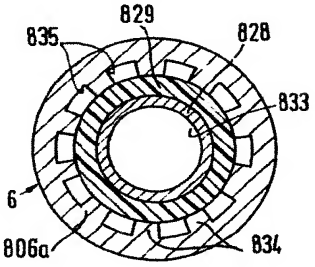


Fig. 31



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